NEW YORK SEATTLE

MOTORSHIP

Devoted to Commercial and Naval Motor Vessels

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EXCLUSIVE technical and non-technical articles on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.

MOTORSHIP

(Trade Mark Registered)

PROFUSELY illustrated with photographic reproductions of the newest designs in international merchant motorship and Diesel-engine construction and auxiliary equipment.

Vol. VII New York, U. S. A., September, 1922 No. 9

(Cable Address—Freemote, New York)

Another American Steamship to Be Converted

New York Shipbuilding Corporation Installing a 2,000 i.h.p. Werkspoor Diesel Engine in a 5,740-Ton Shipping Board Vessel

IF everyone of the leading shipbuilders throughout the country were to convert at once one or more steamships to Diesel or Diesel-electric power of reliable design they would have no difficulty in selling them at prices considerably higher than the current market figures for geared-turbine and reciprocating equipped ships, and at prices that should show a moderate profit on the jobs if efficiently carried out. They unquestionably could dispose of the motorships when completed, if not before the work was finished, regardless of steamers being a drug on the brokers' and owners' hands. Unfortunately, just like domestic shipowners, only a few American shipbuilders have had sufficient foresight and courage to make the necessary financial investment and incidentally produce work for their yards, although the old argument of "doubtful reliability of Diesel power" is no longer given as a reason, but has been replaced by the misleading theory of "excessive cost." This probably accounts for a dozen fairly important shipyards in this country so far not having had the good judgment to adopt or build a Diesel engine, and so are not in a position to convert conscientiously a steamship or build a motorship were they asked to undertake the work.

Possibly the realization of this situation has been more than partly responsible for the New York Shipbuilding Corporation, the Wm. Cramp & Son Ship & Engine Company, and the Sun Shipbuilding Company all building high-powered Diesel engines for the conversion of steamers, and for the first two firms actually having purchased big vessels for this purpose from the Shipping Board with a view to selling the finished motorships to American shipowners.

As we write no information has been made public regarding the recent purchase by the New York Shipbuilding Corporation. The vessel is a single-screw geared-turbined boat of 5,740 tons deadweight built in 1920, the hull of which is very well constructed. After her conversion this ship will have nearly 1,000 tons greater net-cargo capacity than before, will average a better speed, will have a smaller crew, smaller running and stand-by charges in port, will have about one-third of the fuel consumption at sea, and will have many other advantages.

As will be noted from the illustration below, the Diesel engine for this freighter is in a very advanced condition, so the entire job will be ready for sea trials within six months, although the work will not be in any way speeded up. It is a six-cylinder 27" bore by 47" stroke four-cycle, direct-reversible Werks-

Exclusive picture showing present stage of construction of 2,000 i.h.p. Werkspoor engine at the New York Shipbuilding Yard, Camden. Note cast-iron frame design. Steel tie-rods nearly 4" diameter run from the cylinder-box, thru the frames to the bed-plate

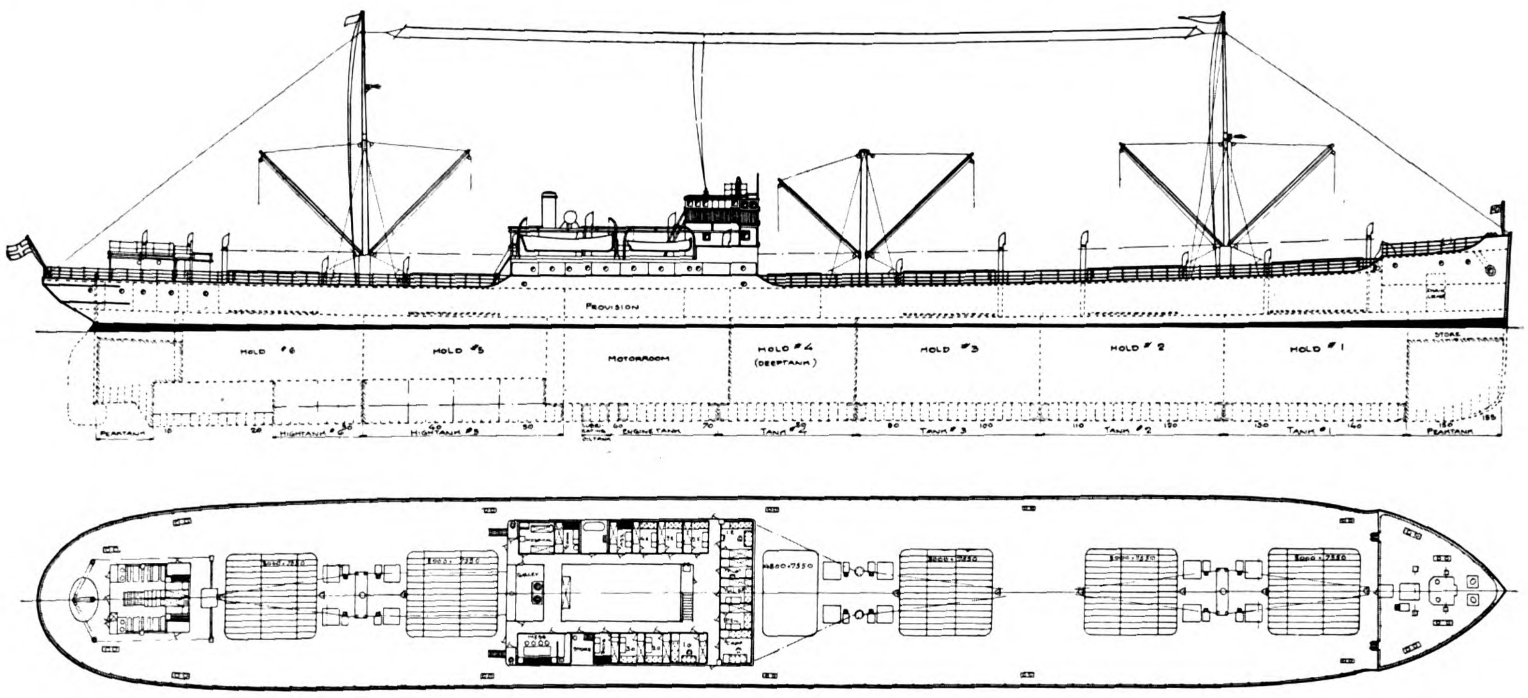
poor engine, modified to American practice by the New York Shipbuilding Corporation's engineers under the personal supervision of H. A. Magoun, senior vice-president, and will develop 1,500 shaft h.p. (2,000 indicated h.p.) at 105 to 110 revs. per minute, the mean-effective pressure being 72 lbs. per sq. inch. The engine weighs 270 short tons, or 360 lbs. per shaft horsepower, and has an overall length of 34 ft.

This length, by the way, is less than that of any other American four-cycle or two-cycle slow-speed crosshead engine of similar power, and is shorter than many Diesel engines of lesser power. As far as available figures are concerned, the only European engines of similar power that have less length are the Nobel single-acting two-cycle, the Cammellaird-Fullagar opposed-piston engines and certain double-acting engines. Possibly, however, a Sun-Doxford engine of 2,000 i.h.p. would occupy a little less space, but the smallest engine of that design is the 3,000 i.h.p. model, which is 42½ ft. long.

Preliminary drawings of this 2,000 i.h.p. New York Werkspoor engine were given in our issue of December, 1921. The engine follows conventional Werkspoor practice, but the diagonal steel tie-rods are replaced by heavy cast-iron frames extending from the cylinder beams. These frames are in three pieces, an A-section resting two smaller sections, the whole being bolted down to the bed-plate by the regular Werkspoor steel tie-rods, which run from the top of the cylinder boxes down to the underside of the bed-plates. The cast-iron frames being in three sections enables the crank-shaft to be rolled out broadsides, by lifting the tie-rods on one side and removing a lower section of the frame.

In fact, our inspection of the engine reveals it to be even more accessible than the parent Werkspoor design, and the latter has always been known for the ease with which any part may be removed for repair or adjustment without disturbing the remainder of the engine. Detachable cylinder extensions for piston removal, long-split-steel tubes for the cam-shaft operation, cylinders and cylinder-heads cast integral and mounted in sets of threes in cylinder-beams or tanks, diagonal-eccentric reversing gear, short-pistons, offset fuel-injection valves, and other well-known Werkspoor features of design have all been incorporated in this engine.

At this time we propose to give a brief outline of the description only; but when the engine is finished, the first completely illustrated technical description will appear in MOTORSHIP. Although this is the first Diesel engine built at the Camden plant no testing will be carried out in the shops, nor will the engines even be run before being installed in the ship, as the builders have sufficient confidence in the Werkspoor design and in their own construction to feel completely certain of the engine working satisfactorily from the start.



Designs of the new type of ore-carrying motorships to be built for the Grängsberg-Oxelösund of Stockholm

More Diesels Sold by Shipping Board

STANDARD OIL COMPANY PURCHASES TWIN 850 SHAFT H.P. PACIFIC-WERKSPOOR ENGINES

A NUMBER of Pacific-Werkspoor Diesel engines stored at Alameda, Cal., were auctioned on August 9th, selling from $29,000 to $31,000 each. This price is more than twenty times as high as the amount received for marine steam-engines of similar power recently auctioned by the Shipping Board.

However, these bids for the Werkspoor marine Diesel engines were rejected by the Board as the prices were considered too low. Following the rejection the Standard Oil Co. of Cal., purchased two of these 850 shaft h.p. engines with a view to converting their tow-barge No. 95 to oil-engine power. This vessel is 316½′ long, b.p., by 50′ beam and 25′ loaded draft. She is a five-masted vessel of 6,000 tons d.w. with a carrying capacity of 50,000 bbls. of oil. This will make the fourth motorship owned by the Standard Oil Co. to have Pacific-Werkspoor Diesel engines.

An 850 b.h.p. Pacific-Werkspoor Diesel engine was also sold to the Federal Light & Traction Co. for installation at Tucson, Ariz. In the plant of a subsidiary, the Tucson Electric Light & Power Company. At this plant two Busch-Sulzer and two Fulton-Tosi engines are already in operation.

PACIFIC-WERKSPOOR ENGINES FOR GOLD DREDGING

Three 525 horse-power Werkspoor Diesel engines are being built by the Pacific Diesel Engine Company at its Oakland plant for the Yuba Manufacturing Company, to be used in gold dredging work at Nome, Alaska.

A CONTRAST!

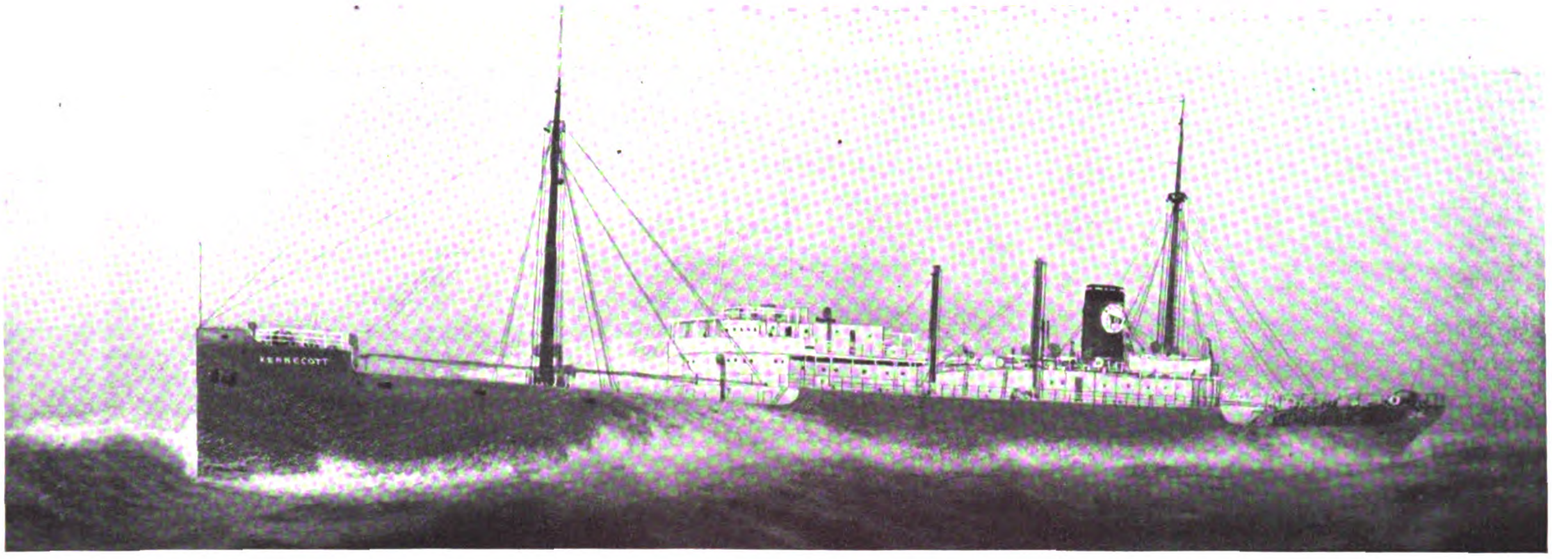
Palmers Shipbuilding & Iron Co., of Jarrow, England, have just secured a contract to build a set of triple-expansion steam-engines for a tanker. In America hundreds of sets of triple-expansion engines of 1,400 to 2,800 i.h.p. have just been "given away" as "scrap" for about a thousand dollars each by the Shipping Board because of the total absence of a market.

The Götaverken ore-carrying motorship "Lule" after launching.

LAUNCH OF ANOTHER ORE-CARRIER

The motorship LULE, the fifth ore-carrier built at Götaverken on the contract for 18 oreships which the shipyard booked for the Grängesberg-Oxelösund Company in 1917, has been launched. According to the contract, two boats have to be delivered every year. It will be remembered that the first two boats built by Götaverken were steamers. It was when the machinery for the third building was to be begun in the machineshop in Göteborg that the ore company decided to go in for motorships to the satisfaction of Götaverken. The Grängesberg Company has not had cause to regret their decision to go in for motorships and the M/S STRÅSSA and the M/S LAPONIA, the two first motorships, are now successfully running in the ore trade from Narvik.

The Grängesberg Company has recently decided about the designs for the eighth and ninth boats. These will be slightly larger, length 405-0″, breadth 55-0″ moulded depth 30-0″, with a carrying capacity of 9,500 tons on 27-0″ draft with Götaverken Diesel-motors of 2,800 i.h.p. twin screw. The arrangement can be seen on the accompanying drawing. The Grängesberg Company is at present shipping about 600,000 tons of iron ore monthly from Narvik alone.



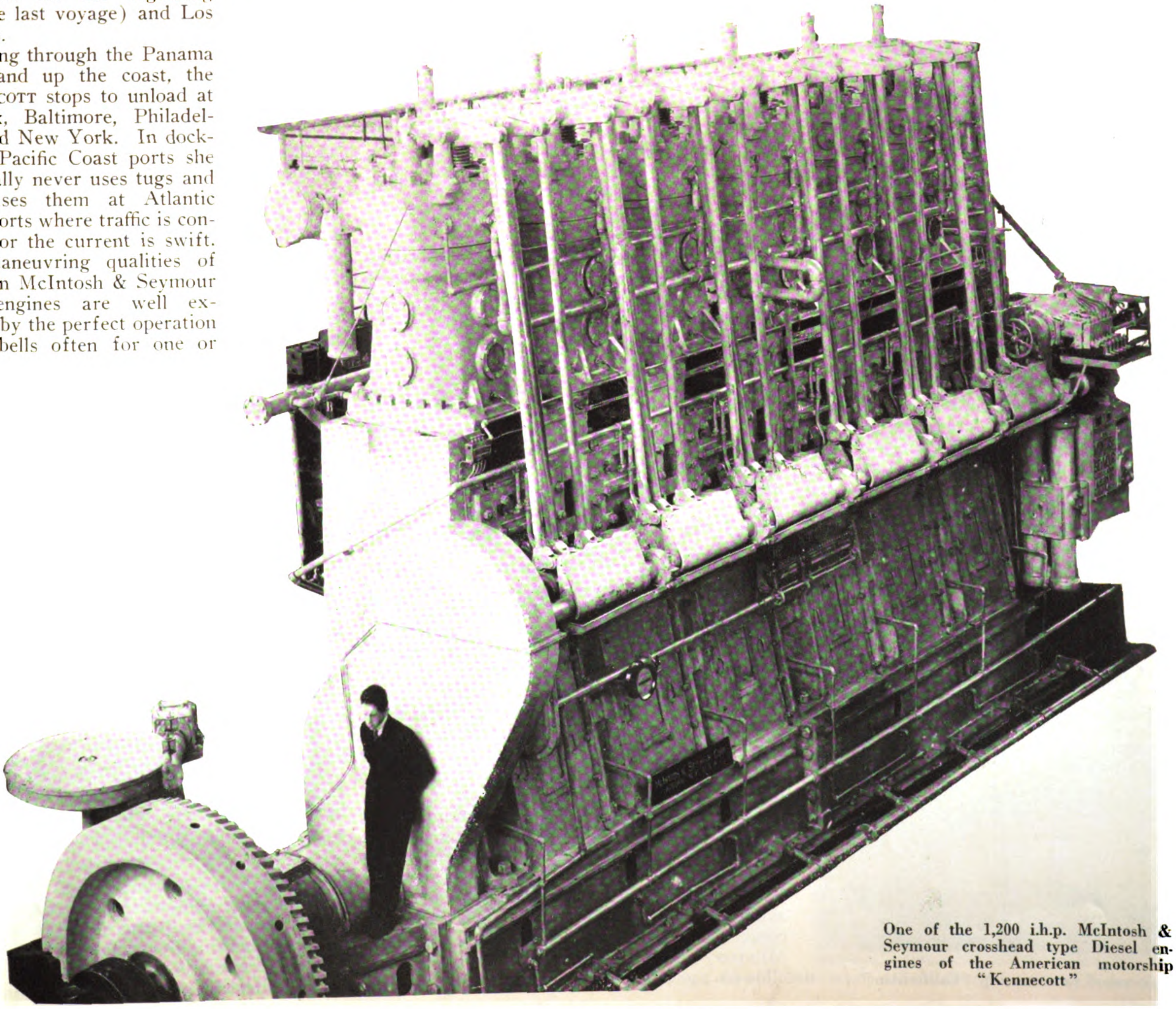
Motorship "Kennecott's" 16 Months' Service

Her McIntosh & Seymour Diesel-Engines Have Never Caused a Delay While Driving Her for 64,000 Miles

THE Alaska Steamship Company's motorship KENNECOTT is known at the Panama Canal, through which she passes on each coast-to-coast voyage, as the ship that has carried the greatest cargo in relation to her tonnage through the Canal during the past year. She is operated by the Williams Steamship Company in its inter-coastal service, leaving Seattle and loading at Tacoma, Portland and at lumber mills in Oregon or Washington, then running down the coast to San Francisco, Oakland (which is a new port for her beginning with the last voyage) and Los Angeles.

Passing through the Panama Canal and up the coast, the KENNECOTT stops to unload at Norfolk, Baltimore, Philadelphia and New York. In docking at Pacific Coast ports she practically never uses tugs and only uses them at Atlantic Coast ports where traffic is congested or the current is swift. The maneuvring qualities of her twin McIntosh & Seymour Diesel-engines are well exhibited by the perfect operation under bells often for one or two hours with signals coming from the pilot house at slight intervals. She will maneuvre when the air-pressure drops to as low as 150 pounds but her engineers regard her air-compressor equipment as extremely efficient and maximum pressure is usually maintained. On the last voyage in entering San Francisco at night the KENNECOTT maneuvered for two hours to wedge in between other craft at the dock and her "bell book" shows bells coming about 15 seconds apart for nearly this whole period.

Her usual cargo from the West Coast is general with a good proportion of canned goods and she usually carries a high deck load of lumber. On her last trip from Seattle to New York she brought about 900 tons of copper pigs in her hold, also a large amount of green hides and Southern California cotton which was, strange to say, unloaded at Nor-



One of the 1,200 i.h.p. McIntosh & Seymour crosshead type Diesel engines of the American motorship "Kennecott"

folk, Va., which port is usually shipping cotton away. There was also a large amount of wool which had been received at San Francisco from China and thus brought to the East Coast.

It is very unusual to see the deck of this motorship, as every time we have seen her come into port she has had both forward and aft decks piled high. But on the West-bound voyage from New York the first week in August, she made the first trip on which she has not carried a full deck-load, this being due to the fact that sufficient steel construction parts could not be received on the dock because of the railway strike.

The KENNECOTT went into service on March 25, 1921, and since that time has been in continuous operation, her mileage to date being 64,000 miles. Her 1,200 h.p. McIntosh & Seymour Diesel-engines have always been ready when the cargo was loaded and she has never been delayed a single moment because of engine trouble.

Chief-Engineer Searles and his staff of American engineers and oilers have always given the machinery the closest attention and have taken the utmost pride in both the appearance of the engine-room and in the efficiency of its contents. It would seem to us from our many visits to this vessel that the opinion which prevails in some quarters that Americans do not readily take to operating Diesel-engines is absolutely discounted by the work of this American crew of engineers. Mr. Searles and his first-assistant, Mr. Feiner, have been on the KENNECOTT from the day she went into commission, and the Chief cannot speak too highly of both the main-engines and of every item of equipment, as they have all functioned perfectly, requiring only the usual amount of work of maintenance.

The KENNECOTT operates on an average of 63 bls. of 16 degrees Baumé California fuel-oil per day and averages a speed of 11 knots.

Possibly some of our readers may have noted recently that the KENNECOTT was reported in collision with a steamer. In order to make perfectly clear that this collision was no fault of the KENNECOTT or of her Diesel-engines, we have taken particular pains to learn the complete story of this collision which occurred on March 8, 1922, about 60 miles west of Havana, Cuba, while she was en route from San Pedro to New York. It seems that the steamer AERO and the KENNECOTT were sailing in mid-afternoon on a perfectly clear day, the KENNECOTT being to starboard of the AERO, which was running on a course almost parallel with that of the KENNECOTT and practically a mile distant. Both vessels held their course, but the AREO, which naturally under International Navigation Laws. was obliged to look out for the KENNECOTT (which was on the AREO's starboard bow), instead of doing so, held her course and when Captain Johnson of the KENNECOTT was called to the bridge by Third Officer Willard who was then in charge of the deck, the AREO was making directly for the engine-room of the KENNECOTT. Captain Johnson immediately swung his ship so that the AREO would strike the stern of the KENNECOTT rather than the engine-room. The investigations that followed were, of course, favorable to the KENNECOTT as she was distinctly in the right under the Navigation Laws. Temporary repairs were made by the Havana Marine Railways of Havana, Cuba, while permanent repairs were made at Seattle upon completion of the voyage.

We are unable, at this writing, to give the costs of operation of the KENNECOTT, but shipowners can readily see that with such full cargoes as this motorship has carried for the past 16 months in constant operation on a low fuel-consumption of 63 barrels per day, that she must be the type of ship which is best suited for inter-coastal service.

We fully believe that her record is a distinct contradiction to the statement sometimes heard that the Diesel-engine is not economically suited for short coastwise-service, but is only adapted for long sea-voyages. No steamship of her size could operate in coastwise-service on such low cost of operation, nor could any steamship of her dimensions have carried as much cargo as the KENNECOTT, which has always been loaded to capacity each voyage.

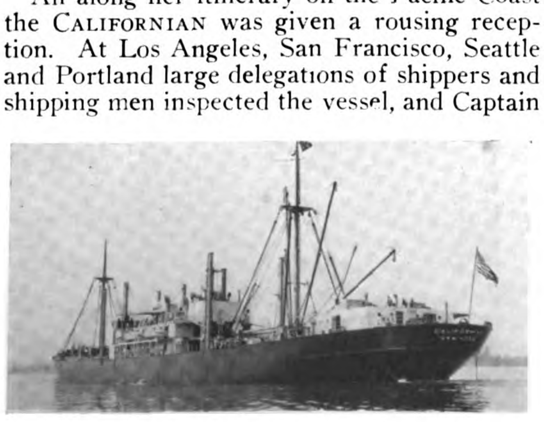
MOTORSHIP "CALIFORNIAN'S" MAIDEN-VOYAGE

We are now able to give our readers a record of the maiden trip of the new motorship CALIFORNIAN, which was fully described in an exclusive article in the June issue of MOTORSHIP. As the first large all-American motorship her performance has been keenly watched and at every port engineers and ship-operators have inspected the vessel and her machinery. The United American Lines, managing agents for the American-Hawaiian, have now received a full report of the ship's maiden voyage to the Pacific Coast, stating that her performance was satisfactory in all respects. The following results of the run from New York to San Pedro, via Boston and Philadelphia, are announced:

Distance, 4,866 miles.
Speed, 12.2 knots, average.
Revolutions per minute, 112.
Slip, 6.2 per cent.
Fuel consumption, 14.3 tons (23.5 Beaume) or 100.5 barrels per 24 hours.
Pounds of fuel per indicated horsepower per hour, 0.304.
Indicated horsepower developed, 4,405.
Mean draft, 21 feet 11 inches.
Running time New York to San Pedro, 16 days 23 hours.

In addition to the performance of the propelling machinery the report states that all electrical equipment, winches, etc., worked in good order. On the Pacific Coast 15,000 tons of cargo were handled without a hitch or delay.

All along her itinerary on the Pacific Coast the CALIFORNIAN was given a rousing reception. At Los Angeles, San Francisco, Seattle and Portland large delegations of shippers and shipping men inspected the vessel, and Captain Lyons was given many gratifying compliments on his fine new charge.


The American motorship "Californian"

The MISSOURIAN, sister ship of the CALIFORNIAN, is now on her first voyage to the Pacific Coast in the United American's inter-coastal service.

FURTHER REMARKS ON THE OPERATION OF THE EAST ASIATIC CO.'S TANKER "MEXICO"

Recently we again went aboard the Holeby-engined tanker MEXICO, at the docks of the Standard Oil Refinery at Bayonne, N. J., when this vessel was in port on one of her regular trips between New York and Scandinavian ports. It will be remembered that the MEXICO was described on page 45 of the April, 1919, and page 207 of the March, 1920, issues of MOTORSHIP and that she is of the following dimensions:

Length	300'
Breadth	44'
Depth	38'
Power	1,600 shaft h.p.
Speed	10½ knots
D.W. capacity	4,700 tons

This vessel is used in supplying fuel to the large fleet of motorships operated by the East Asiatic Company and in transporting oil to fuel stations abroad. When we went aboard in the latter part of July she was loading 4,200 tons of petroleum and gasoline for Göteborg and Malmö, Sweden. Her engine-room crew consists of Chief-Engineer, 2nd-Engineer (who also acts as electrician), 3rd-Engineer, 4th-Engineer, four assistant-engineers and three oilers. In talking with 2nd-Engineer Bram, we found that the two 800 shaft h.p. Holeby Diesel-engines operate with the utmost reliability and with little attention. We found that fuel-valves are removed only after two round-trips and exhaust-valves are operated on four or five transatlantic trips before being removed, ground, and replaced.

The average consumption including auxiliaries, which are two Holeby Diesel-engines of 100 h.p. connected to 70 k.w. electric generators, is 5½ tons per 24 hours, using Diesel oil of about 28 degrees Baumé. Her average speed is 10½ knots. Under the best conditions she has made 12 knots. The MEXICO formerly had propellers which allowed 140 r.p.m. but larger propellers have since been fitted and these now operate at 133 r.p.m., which is considered an improvement in operation.

FUTURE CONSTRUCTION OF WERKSPOOR ENGINES

In the description of the North-Eastern Werkspoor engine on page 607 of our August number, we referred to a report that Werkspoor would divert from steel column construction to cast-iron frames. This, however, is not exactly the case. The actual fact is, Werkspoor has prepared designs for eight-cylinder engines of 29.921" diameter by 55.118" stroke to turn at 95 r.p.m. This particular engine will have cast-iron column construction. The engines of lower power—as hitherto constructed, will have steel columns unless specially ordered with cast-iron columns. The original report referred to regarding the cast-iron column construction was published by a British magazine.

MOTORSHIP YARDS BUSY

The Sun Shipyard is to build four 3,000 b.h.p. Diesel-electric dredges, is converting two 4,200 ton freighters to Diesel-electric power and is constructing one 3,000 i.h.p. Diesel engine. Meanwhile, many steamship yards are devoid of orders.

A 100 b.h.p. Fairbanks-Morse oil-engine is to be fitted in a tug owned by the Puget Sound Navigation Co.

E. K. Wood Lumber Co. of Seattle are converting a sub-chaser to twin 90 b.h.p. Atlas-Imperial Diesel power.

TORDENSKOLD, a halibut schooner owned by Paul Pedersen & N. B. Hegge of Seattle, is having her gasolene motor replaced by a 60 b.h.p. Fairbanks-Morse oil-engine.

In our last issue we stated that the two fruit-carrying motorships PINZON and PIZZARO were built by Richardson-Westgarth and engined by Wm. Beardmore & Co. This is incorrect as both boats were built and engined by Wm. Beardmore & Co. of Dalmuir.

Exhaust Valves of Nickel-Chromium Alloy

"Nichrome," an Alloy Produced by Driver, Harris Company, Said to Be Practically Immune to Pitting, Warping and the Other Destructive Forces

PRODUCTION of a poppet-valve metal, or alloy, that would better withstand the destructive forces that are created in the operations of high as well as low-powered internal-combustion motors has been a problem for many years, and the solution to which should be welcomed by every designing engineer and oil-engine builder. Because of the severe conditions under which big exhaust-valves of high-powered Diesel-engines—some up to ten inches diameter—have to work it is only natural that metallurgists have made considerable efforts to develop on a commercial scale steels and alloys that would overcome the need for constant regrinding and replacing of valves made necessary by the deteriorating effects of heat, the products of combustion, and heavy mechanical stresses together with outside influences such as high-sulphur oils, salt water, etc. While certain progress has been made from time to time, the results attained have invariably betrayed weaknesses in one way or another, that little was actually gained over the original and ordinary cast-iron and steel valve which has a tendency to carbonize, warp and deteriorate. Any metal subject to such, naturally has a possibility of producing trouble at unexpected moments, so that the operator cannot place thorough reliance upon that part of the engine under service conditions.

One of the arguments raised against the four-cycle type Diesel-oil engine for marine work by two-cycle engine-builders is that, when using heavy crude and residual oils such as Mexican fuel—particularly oil with sulphur varying from one to three per cent., additional work is given to the engine-room crew owing to the exhaust-valves becoming pitted and requiring re-grinding every voyage, and sometimes twice per voyage. This, of course, does not occur so often when burning Diesel-oils, or heavy crudes without sulphur contents such as Taraken oil.

Even this, however, will be dispensed with or greatly reduced if all the claims and tests of a nickel chromium alloy recently placed on the market meets with successful confirmation in actual seagoing service in the oil-engines of large and small motorships. We refer to Nichrome, a heat-resisting metal developed into valves under patents by the Driver-Harris Company of Harrison, N. J., and now available in large quantities after three years experimenting and exhaustive tests. We conscientiously advise all four-cycle engine builders to thoroughly test this alloy for valves.

So satisfactory and unusual has been the service given by Nichrome valves that they have been adopted as standard equipment by many companies. A test now under way on a large American Diesel vessel which has tried out other valves for which exceptional service has been claimed, shows Nichrome valves still in splendid condition, without any attenion, after 15,000 miles, and with the engines running on boiler-oils. The chief engineer of the motorship in question expressed enthusiasm to a representative of MOTORSHIP on the occasion of a recent visit. The engineers of the Winton Engine Works have also expressed their approval of Nichrome to us, having adopted these valves as a standard for all their Diesel-engines.

In view of the radical benefits that will be derived from the many adaptations of Nichrome if this new metal proves as satisfactory as tests and present commercial uses indicate, there is but little doubt that it will be widely adopted in this field. Meanwhile oil-engine builders will do well to thoroughly investigate its possibilities and make extended tests for themselves, both in the shops and in ships fitted with their engines in cylinders side by side with cylinders having other valves. We understand that the makers will be glad to make a Nichrome valve to the builder's drawings and furnish one for the purpose of a test.

Doubtless a few details regarding the history and development of Nichrome will be of interest. This basic alloy is not new. For more than fifteen years Nichrome, manufactured by the Driver-Harris Co., has been used as heat-resistors in electric-heating equipment. The present development and broad utility of electric heat, in both industrial and domestic applications, would have been impossible without an alloy that is highly capable of resisting heat and oxidation. Indeed, the electric heating industry could not have succeeded in any measure without such an alloy.

Its first mechanical adaptation and application in a large way was as heat-treating or carbonizing containers for case-hardening processes. In this field, as in the valve field, cast-iron had been used before this heat-resisting alloy was made available in the form of cast containers. The containers are subjected to high heat (1,500° to 1,800° F.) and to severe oxidizing conditions. The Nichrome alloy developed for carbonizing containers has not only overcome these conditions, but is totally immune to carbonizing, and is giving thousands of hours of uniform service. Cast iron and other containers have been replaced in hundreds of plants throughout the country.

Being pioneers in the development and manufacture of heat and chemical resisting alloys it is altogether logical that attention should be turned by the makers to the poppet-valve question. This constitutes another development of the alloy Nichrome.

Engineers familiar with the functions of valves in internal-combustion oil-engines will immediately recognize the value of the characteristics outlined in the following, and the great advantages which valves possessing those characteristics, should add to even the very best designed engines. The points are therefore briefly stated:

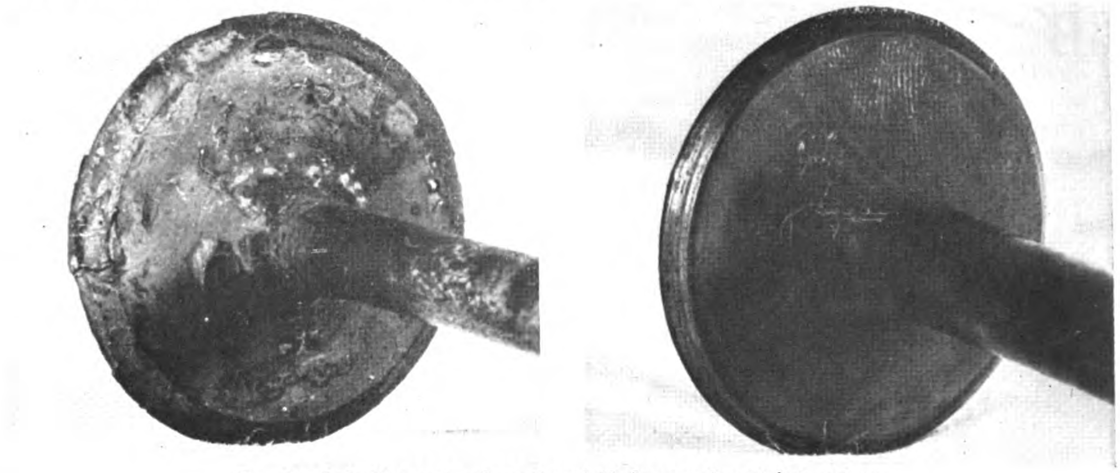
Nichrome alloy for valves has a tensile strength of 20,000 pounds to the square-inch at 900° C.

At temperatures approximating 2,000° F. there is no scaling.

Highly resistent to chemical action of combusting fuel.

Will not absorb carbon.

The action of the valves does not injure valve-seats, because they are not extremely hard; but they are hard enough to withstand the shock of constant pounding.



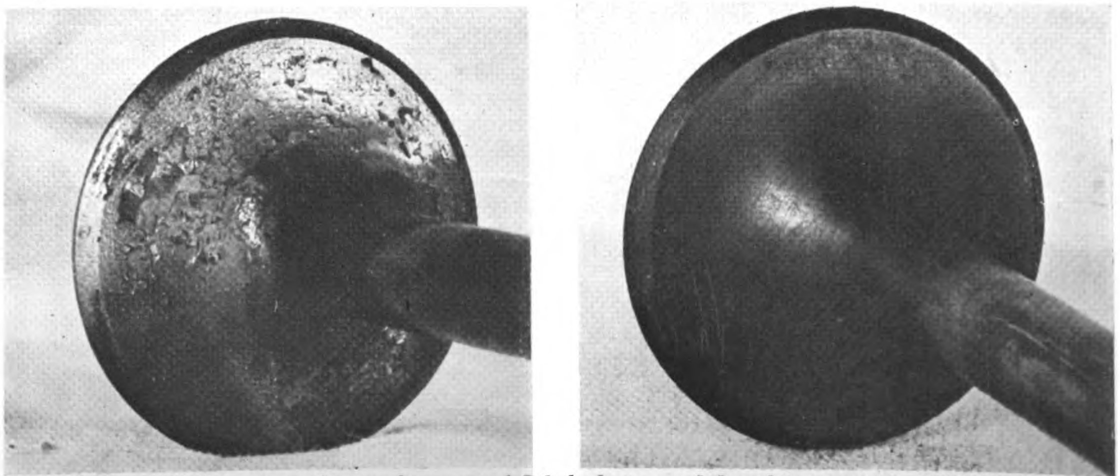
Result of similar tests of steel and Nichrome (on right) valves

Are made either in one piece or in two pieces with nickel-steel stem.

Hold compression to an unusual degree, because the heat of exhaust-gases does not cause pitting to any appreciable extent.

Cannot be hardened or crystalized by heat-treatment; retain their same physical properties as when installed. Therefore, they do not air harden.

The established facts which are cited above, are based on the performance of a considerable quantity of Nichrome valves made by Driver-Harris for use in Diesel-marine-engines, for aircraft motors and automobile engines. So satisfactory have the results been over a long period of time, and even under adverse fuel conditions, that they have felt justified in providing additional manufacturing facilities so as to place Nichrome valves within reach of every owner and builder of internal-combustion engines.



Results of similar tests of two valves, one of Cobalt-chrome and the other (on right) of Nichrome

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VERY BRISK BUSINESS IN THE MOTORSHIP INDUSTRY

Sixty Orders Just Placed or About to Be Contracted for Big Oil-Engined Craft—A Large Number of Smaller Commercial Motor-Craft Building and in Prospect

BECAUSE of the numerous orders just placed and in immediate prospect, conditions of trade in the American motor-vessel industry are exceptionally bright at the moment, with equally pleasing prospects for early next year. Months ago we forecasted an almost wholesale conversion of American steamers to motor-power, and we are pleased to say that this work has actually commenced in earnest. Elsewhere in this issue we are enabled to announce that the New York Shipbuilding Corp. have purchased from the Shipping Board a cargo steamer in which they will install a 2,000 horsepower New York-Werkspoor Diesel engine that they have nearly finished building. The auxiliary oil-engines for this ship will be bought from some other American firm. Then the Standard Oil Co. of Cal. have just purchased two 1,100 i.h.p. Pacific-Werkspoor Diesels which they will install in their 6,000 tons d.w. barge No. 95.

Also, we announce that the Sun Shipbuilding Co., Chester, Pa., has secured the order from the Munson Line to convert to McIntosh & Seymour Diesel power the two Lake-type 4,200 tons vessels they recently purchased from the Board. This is in addition to the installation in a hull of the first 3,000 b.h.p. Sun-Doxford oil-engine as soon as completed. This yard also has just secured a 2½-million-dollar contract from the U. S. War Dept. to build four 3,000 b.h.p. McIntosh & Seymour Diesel-electric dredges. Then the Wm. Cramp & Son Ship & Engine Building Co. are proceeding with the conversion of the turbine freighter, SEEKONK, to Cramp-Burmeister & Wain Diesel power, and are at work on the designs for the two 10,000 tons 17-knot Diesel passenger, mail and cargo motorships for the Oceanic Steamship Co., which will be built if Congress passes the subsidy act. Two Board steamers are soon to be converted by C. D. Mallory & Co. to Diesel-electric drive, one for themselves and one for an associated concern. A well-known American steamship line is now negotiating with several shipyards to convert a couple of Shipping Board hulls to either American-Werkspoor or Sun-Doxford Diesel drive. The U. S. Navy's former towing ship, BOXER, is now being converted to Atlas-Imperial Diesel drive for Government service in Alaska; and the Lillico Tug Boat Co. of Seattle are to build an 800 h.p. Diesel tug. The Admiral Line (Pacific Steamship Co.) will shortly place contracts to convert the four MOONLITE class and two larger freighters to McIntosh & Seymour or other equipment, and the Erie Railroad are figuring on converting two Hudson River ferries to direct Diesel power. Also, the Pennsylvania Railroad may build a motor ferryboat and another Diesel tug. The United Fruit Co. of Boston have recently placed a contract for three Cammellaird-Fullagar 3,000 horsepower Diesel-electric passenger-fruit carriers, only this particular order went to England, partly through the owners' attention having been attracted by a British advertisement in the pages of this magazine, partly because there is no constructional-licensee for this engine in the U. S. A. and partly because of financial connections. The new Craig-engined motorship, SUPHENCO, is nearly finished and soon should be ready for sea, while the second 3,000 h.p. Bethlehem-West Diesel engine is practically ready for installation in one of the Company's fleet. Soon the Golden Gate Ferry Co. will order their third Diesel-electric ferry, and the Standard Oil Co. of Cal. is expected to contract for a second Diesel-electric tanker. Other orders are in view, including a new motorship for the Nawsco Line; a conversion job for the Matson Navigation Co.; two new passenger-cargo Diesel ships for the Red D Line; three motorships designed by Geo. G. Sharp of New York for an American steamship firm, on which bids have just been asked; shortly the Puget Sound Navigation Co. will build a big Diesel-electric ferry of 2,400 h.p.; the Southern Pacific Steamship Co. may soon build a large motorship; the U. S. Coastguard Service propose to construct two Diesel-electric cutters of 2,400 and 1,200 shaft h.p. respectively; the New England Oil Company are planning to build two Diesel-driven tankers for their West Indian service; then the 6,000 ton Diesel-electric cable ship on which bids were turned down is still a live matter; also Hibbard-Swenson & Co. are still interested in prospects of building a Diesel-driven cargo carrier; the Standard Oil Co. of N. J. has reinstated a pre-war contract with the Howaldtswerke of Kiel for a Sulzer two-cycle Diesel-driven tanker of 15,870 d.w. tons. Twin 1,500 shaft h.p. engines are to be installed. The Company is also negotiating with Krupps of Kiel, for another motorship contract. Then there are two 2,000 tons Diesel-electric canal motorships to be ordered by the Minnesota-Atlantic Transit Co. of Duluth, Minn.; and last but not least the seven Diesel-electric ferries shortly to be built for the City of New York.

In these vessels alone we have 19 conversion jobs and 41 new motorships building or about to be laid-down. If Congress acts favorably and speedily upon the subsidy question much additional Diesel motorship work will be placed, which will assist in providing work for the ship, engine and equipment plants of the country. Some of the aforementioned work is awaiting the subsidy.

In the motor workboat field business is even brisker in proportion at the present time especially on the Pacific Coast. During the last several months well over a hundred orders for Diesel and surface-ignition engines of 50 to 500 h.p. for commercial boats have been placed; one firm at Oakland, Cal., alone has secured contracts for more than fifty of the engines this year. Many new large Diesel yachts are being built and more are in prospect for completion by next summer for well-known yachtsmen. On the whole the conditions in the industry covered by this magazine are most favorable.

Probably the most remarkable indication of the extraordinary growth of the motor-vessel and oil-engine industry is to be found in the latest report of Lloyds Register. **There are now 1,639 oil-engined motorships of 1,511,000 gross tons (2,450,000 tons deadweight) registered with this Society,** including 149 vessels of over 3,000 tons gross. But this registry refers only to motor-vessels of over 100 tons. In addition there are thousands of oil-engined work-boats in service, a large number of which have been added during recent months, particularly in the United States. There are now 2,793 steamships burning oil under their boilers. The rest of the vessels burn coal.

That this rapid growth is taking place while the steamship building industry is on the downward grade accounts for the paid-circulation of "MOTORSHIP" having shown a steady and continuous increase during this period, including throughout the past nine months of this year. Without question "MOTORSHIP" is rapidly gaining the position of leading magazine in the merchant-marine field and its circulation is of extraordinary high-grade nature, which should be borne in mind by all firms allied to the industry when laying-out their advertising appropriations.

AMERICAN MOTORSHIPS VERSUS FOREIGN MOTORSHIPS

ARGUMENTS have been put forward by shipping "experts" that it is of no use building motorships in this country because foreigners also are constructing this class of vessel and that American Diesel-driven vessels will not be able to compete with the same. It certainly seems extraordinary that men who, because of their positions in the shipping business should know better, put such ribald rot in print. Ships of our merchant marine have the advantage of obtaining oil at the lower cost. A significant instance in this connection recently came to our attention. A British publication was discussing the performance of a motorship using Persian boiler-oil and pointed out the advantages of this cheap fuel compared with the so-called Diesel oil. The total mileage of this vessel up to the time of writing was 16,000 nautical miles of which 4,700 had been covered when using boiler-oil of 0.79 specific gravity containing 1.30 per cent sulphur.

It is pointed out that the cost of the fuel which is bunkered at Southampton was £3-3-10 per ton of 7 barrels, or approximately $15.40 at the current rate of exchange of about $4.40 to the pound. At the time this oil was bunkered fuel of a similar grade that was actually being used by many American motorships was costing a little under $9.10 per ton, while the better grade of Diesel oil could be obtained by motorships in American ports for less than $12.00 per ton. Thus it will be realized that the fuel bill of an American motorship is generally likely to be half that of a British motorship if both craft use the same grade of oil.

SUN SHIPBUILDING CO. AND U. S. DREDGE CONTRACT

THE SUN SHIPBUILDING COMPANY, of Chester, Pa., is being awarded the contract for the construction of the four steel McIntosh & Seymour Diesel-electric dredges for the U. S. War Department, plans of which were published in the July issue of "MOTORSHIP." There were ten bidders for this contract and competition was keen. The bid of the Sun Shipbuilding Co. was considerably below the appropriation which Congress has made of $800,000 per vessel. Their bid for the four ships was $2,528,240.

Inspection and Tow Boat for the San Francisco Harbor Board

Enterprise Diesel-Engine Installation Made After Careful Technical Study

By DAVID W. DICKIE

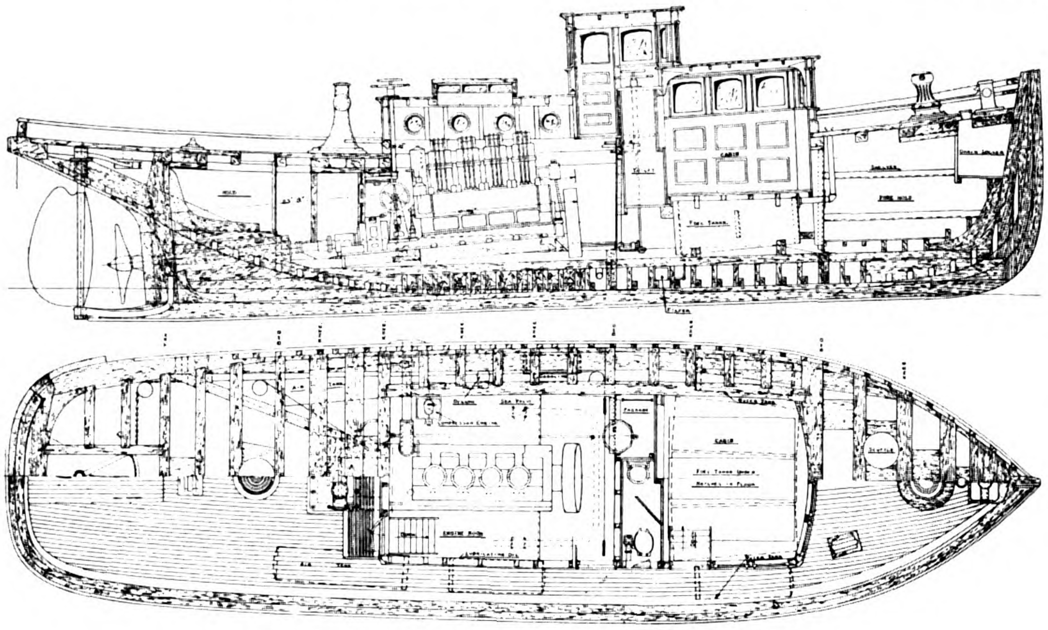
THERE are so many unusual and interesting features about this new craft that we feel that MOTORSHIP readers will appreciate a detailed description of both hull and machinery. The general outlines are somewhat similar to Pacific coast heavy-duty tugs, but certain features are altered to suit peculiar conditions outlined by the California Board of State Harbor Commissioners, of which Frank G. White is the Chief Engineer.

To properly house a party of engineers on an inspection trip, a cabin is built forward of the pilot house, finished in mahogany paneling. The usual upholstered seats have been omitted and substituted therefor will be Pullman wicker chairs of such height that one can see out of the windows. view over the cabin and the steering-grating aft had to be put at the corresponding height to see through the pilot-house windows. The entrance to the engine-room being at the after end, the operator starts the engine and by staying at the after steering-gear control can watch the engine until it is properly warmed up. He then can go into the pilot-house and operate the vessel by means of the controls there. The machinery being aft, the rudder was made of iron arranged to be unshipped for the purpose of drawing the propeller shaft. The stem is of oak, sternpost of ironbark, and the remainder of the boat of P. S. pine, all timbers being in one piece where practicable, the bent frame construction being used. the remainder of the boat of P. S. pine, all timbers being in one piece where practicable, the bent frame construction being used.

Due to the fact that the boat is to be called upon to go between the pile-drivers or dredger and the wharf on occasion, the deck was strengthened laterally with a towing-stringer on each side and the midship steel-bulkhead has a heavy stiffener across it to help to take the thrust. The steel bulkheads also have the vertical-stiffeners spaced to suit the studs of the joiner-work.

The boat was designed by David W. Dickie, and built by the Pacific Boat Company of Oakland, Cal., and is of the following dimensions:

Length over all	57′ 0″
Displacement length	50′ 0″
Beam over plank at the deck	15′ 0″
Crown of beam—2″ in	15′ 0″
Draft at the sternpost	6′ 11½″
Freeboard at the lowest point of sheer	2′ 4″
Depth of hold	6′ 2″
Depth from the top of the deck at the side to the rabbet line amidships	7′ 10″



General-arrangement plan of the "Governor Stevens"

Due to the extra weight of the Diesel-engine over the weight of a gas-engine of equal power (about 10,307 pounds installed) the total displacement of the boat runs up to 51 tons. This extra weight is not all in the engine as the air-tanks are 1,500 pounds heavier; there is an extra gas-engine-driven compressor to recover the air-pressure if it is lost; the tail-shaft is larger in diameter, etc. The Diesel-engine coming to the front so rapidly, the Harbor Board were persuaded to install that type of motive-power, and as they were so equipped with arrangements to supply their dredgers and tugs, it was desirable if possible to get an engine that would run on steamer fuel-oil.

The contract for the machinery was awarded to the Enterprise Engine Company for the type of engine that operates similarly to the Hvid principle in that the fuel is supplied by what is known as solid-injection into the cup when the piston is at the bottom of the stroke at 10 pounds pressure or less. Compression takes place up to 480 pounds plus or minus, sufficient air being forced back through the holes into the cup to cause partial ignition therein, whereupon the unignited part of the fuel is forced out into the cylinder where combustion takes place. The expansion of the fuel delivers the power to the piston on the down-stroke.

The up-stroke is the scavenging-stroke and the next downward-stroke draws fresh air (oxygen) into the cylinder for the next cycle making a four-cycle engine.

The fuel used is what is known commercially as fuel-oil, and for starting in cold weather a lighter oil, known as Diesel-oil of 24 degrees Baumé is used, the characteristics being given on the next page.

The Diesel-oil is used at 60 degrees Fahrenheit and has a viscosity of 122 sec. Saybolt meter.

The fuel-oil used in the preliminary test had the following viscosities in seconds Saybolt at the temperatures given, it being necessary to heat this fuel in order to get it to flow through the pumps and small holes of the injection-nozzles; time 60 cubic centimeters to pass the Saybolt meter.

60 degrees Fahr	13.29 Sec.
70 " "	880 "
80 " "	600 "
86 " "	488 "
90 " "	428 "
100 " "	312 "
110 " "	233 "
120 " "	179 "

California State Board of Harbor Commissioners Enterprise Diesel-engined Inspection Boat "Governor Stevens"

Enterprise Diesel-engine being Lowered into the "Governor Stevens"

Degrees Fahrenheit.	*Fuel-Oil used on preliminary test.*	*Fuel-Oil used on final test.*	*Diesel-Oil. for starting.*
Baumé (usually sold as 14)	18.37 degrees	19.4	24 degrees
Special gravity	0.9436	0.9327	0.9091
Pounds per U. S. Gal	7.858	7.804	7.571
Ash (passes 200 mesh)	0.024%	0.008%	0.037%
Asphalt (residue steam distillation by weight)	35.49%	Insol. in gasoline, 1.79%	3.41%
Sulphur	0.65%	0.367%	0.45%
British Thermal Units per pound	18689	18956.8	18916
British Thermal Units per gallon	146858	147,938.87	143213
Flash		212° Fahr.	
Fire		246° Fahr.	
Viscosity at 60° Fahr.		870 Sec. Saybolt	

130	"	"	140 "
135	"	"	122 "
140	"	"	110 "

The Enterprise Diesel Engine Company ran the preliminary test on the fuel-oil at 86 degrees Fahrenheit, the viscosity at this point being 488 seconds Saybolt, or 36.7% of the viscosity at this point of the fuel-oil at 60 degrees Baumé Diesel-oil. The final test was four times the viscosity in seconds of the 24 degrees Baumé Diesel-oil. The final test was run without heating the fuel as the higher Baumé test of the fuel made heating unnecessary.

An effort was made to obtain fuel-oil of 14° Baumé for the test, but the oil billed at 14° Baumé tested as given above, and the writer found upon investigation that the 14° Baumé fuel is unobtainable commercially at San Francisco. A heating element is placed in a circuit of fuel-oil that is taken from the tank, heated and passed either back to the tank or the pumps until the temperature of the system rises to 86 degrees Fahrenheit and the viscosity is reduced to that given in the previous paragraph. This enables the oil to be handled nicely by the small pumps. It will be noticed from the table that at 135 degrees Fahrenheit the fuel-oil has the same viscosity as the Diesel-oil at 60 degrees. The fact that the Enterprise-Hvid type engine uses the fuel-oil at 86 degrees Fahrenheit indicates, however, that it is not necessary to reduce the viscosity to that of Diesel-oil, which is only 9.18% of that of the fuel-oil.

During the preliminary and final test runs on the engines the following average results were obtained:

	Preliminary.	*Final.*
Horsepower rated	100	100
Horsepower by test	109.59 to 121.2	106 to.118
Good average horsepower	112.6	112
Brake mean effective pressure	74.8	74.2
Bore of cylinder	9¼"	9¼"
Stroke	14"	14"
Number of cylinders	4	4
Revolutions per minute	318	318
Weight in pounds	21,950	21,950
Average fuel per horsepower hour	0.405	0.3981
Horsepower per gallon	19.6	19.6
Fuel used	18.37°	Baumé 19.4
Pounds per gallon	7.858	7.804

The tests demonstrated conclusively that the Harbor Board were entirely justified in installing a Diesel-engine instead of a gas-engine as the boat had only to operate one hour and twelve minutes per day for three hundred days a year for the gas-engine to cancel out, as the fuel cost of the gas-engine was 349% of that of the Diesel-engine.

Practically every gasolene engine company around San Francisco bay has been experimenting with systems of solid injection similar to those used by Doxford, Cammell-Laird, Vickers, etc., the English manufacturers.

With the high-pressure solid-injection the spray of oil from the nozzle is so finely atomized that it will light with a match in the open atmosphere.

The writer found that the complete line of engines of one gas-engine company had been designed to be converted to Diesels. The engines were designed with a certain size of crank-shaft, having in mind that the same crank-shaft would take a smaller sized cylinder of the Diesel-engine. All of the remainder of the engine is the same, the cam-shaft to be altered to drive the pump-set.

Considerable difference of opinion exists regarding the oil-pressure to be used for injection from that of 10,000 pounds of the Doxford engine to the 3,500 to 4,000 pounds of some of the other designs, but all have the same method of atomizing, varying only in details. The high-pressure engine manufactured by the Enterprise Engine Company uses 4,000 pounds pressure on the fuel line.

The high-pressure engines run on the 24° Baumé fuel-oil. From the paragraph on viscosities it would be supposed that by heating the steamer fuel-oil to say 140° Fahrenheit whereby the viscosity is reduced below that of the 24° Baumé fuel-oil it would pass through the 8 to 12 thousandths holes in the nozzles of the high-pressure engines. The writer found from a careful experiment that there is some other factor to be taken into account as the heated fuel refuses to flow indefinitely at 140° Fahrenheit. It seems to form a sticky gum in the nozzle which finally closed the small holes. Further experiments are contemplated.

The next experiment that is under way is putting the fuel through the De Laval purifier for the purpose of removing any entrained water as some of the Diesel-engine manufacturers have found that the water combines with the sulphur producing an acid that destroys the iron of the cylinders.

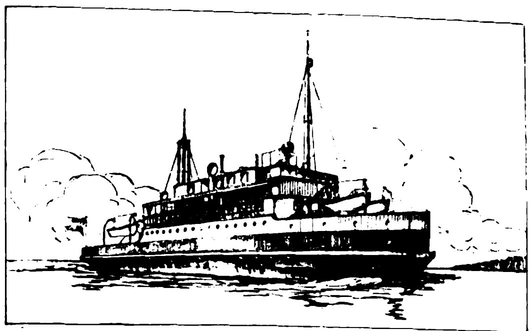
Some special features were introduced into the design such as the lubricating oil system It is force feed throughout and the waste oil that returns to the sump is removed from the system and passed through a No. 200 De Laval oil purifier to be cleansed and from there passed to the cooler tank. Ordinarily the oil is taken from the sump run through a cooler in the circulating water system and back to the cooler tank. The fresh oil is taken from the storage tank to replenish the oiling system. The amount of lubricating oil recovered by this machine pays for the entire cost of the machine in a short while and leaves a handsome profit for the owner.

One feature never tried before on a practical scale was the adoption of the rubber stern-bearing invented and patented by C Frederick Sherwood of the Oliver Sherwood Company. The babbetted stern-bearing was removed and another bearing having soft rubber for the bearing surface substituted. The hard rubber is first vulcanized to the inside of the bearing and the soft rubber vulcanized inside of it, the bearing is then ground to the exact size of the bushing on the shaft. The friction is less than that of an oil-lubricated babbett-bearing, and quite a noticeable reduction in vibration at the propeller is observed. A special propeller was designed as a compromise between speed and towing being 54½" diameter 39" pitch 3 blades, 33 feet area polished manganese bronze, the engine turning it 325.5 revolutions per mintue.

The vessel was launched April 12, 1922, an appropriate ceremony taking place in which Mr. J. H. McCallum, president of the Board of State Harbor Commissioners of San Francisco, Cal., represented Governor Stephens of California, and Miss Marjorie McCallum acted as sponsor, christening the vessel GOVERNOR STEPHENS, in honor of the executive of the State of California. She is now in service and giving satisfaction.

THE MOMMARK FERRY

In the August issue of MOTORSHIP, page 626, a brief description was given of the new Diesel-engined ferry built for service at Mommark, to the order of the Danish State Railway. At the time these lines appear in print trials will have been run. This vessel



The Mommark ferry as she will appear when completed

will have a capacity for 400 passengers and either twenty automobiles or four loaded railroad cars. Propelling power is furnished by twin 350 shaft h.p. Holeby Diesel engines. The vessel is very complete, having a passenger salon, restaurant and there is a repair shop.

DIESEL-ENGINE SAVES EIGHTY-NINE PER CENT OF FUEL COST

Capt. A. E. Anderson, of Oakland, Cal., has his tugs engaged in the work of hauling sand and gravel from Steamboat Slough on the Sacramento River to Oakland, a distance of 75 miles. He formerly operated the tug OLAVA, equipped with a 50 h.p. distillate-engine, but replaced this engine with a 55 h.p. Atlas - Imperial Diesel - engine with most remarkable results.

Not only has the Diesel - engine operated with perfect reliability on 24 degrees Baumé-oil, costing 4¼ cents per gallon, but the OLAVA makes the trip, towing barge, in 10 hours, whereas she formerly occupied 13 hours. Upon arrival at the sand-bank at the Slough the engine is disconnected from the propeller and hooked up to a pump which transfers 250 yards of sand to the barge in four hours.

However, the great work done by the Diesel-engine is in reducing the fuel-bill per week from $70 with the former distillate-engine to $7.50, which is a saving in fuel cost alone of 89 per cent. As evidence that this Diesel-installation has been satisfactory, Capt. Anderson states that before he had used the OLAVA two months he ordered an 80 h.p. Atlas-Imperial Diesel-engine for his tug RUSTLER. It is to be expected then, that Capt. Anderson's letter to MOTORSHIP is full of enthusiasm for the Diesel-engine.

The Independent Towing Co. of Seattle, Wash., is converting the former U. S. Engineer office tugboat, ARAGO, to oil-engine power This company operates four motor-tugs, i. e., WASP, HORNET, CRICKET and BEE.

For towing barges between Oakland, Cal., and Bay Point, the Coos Bay Lumber Co. has ordered a Diesel-tug from designs by David W. Dickie of San Francisco. She will be of wood construction 57 ft. long, 16 ft. breadth, 6 ft. 2 in. depth and will be powered with a 165 h.p. four-cylinder 10" by 14" Enterprise Diesel-engine. Based on comparison with a gasoline-boat it is estimated that this Diesel-tug will do the same work in two hours less time at a cost of $7 as compared with $40 for the gas boat.

Service of the Motor-Lighter "Worthington"

This Wide Departure from Harbor-Lighter Practice Has Proven a Complete Success

WHEN we were privileged to attend the demonstration run of this new motor derrick-lighter owned by the Worthington Pump and Machinery Corporation during March last we were convinced that the splendid performance which was made at that time would be maintained in actual service. And we were right. Owners of steam-lighters in New York harbor admit that she is "some boat" and it will not be long before similar craft are built. For not only has the WORTHINGTON been in constant use without being held up on account of any engine trouble, but she handles quicker than a steam-lighter and maneuvers perfectly; her electric hoisting-winch and derrick handle loads up to 25 tons with perfect control, landing such a load on a dock as lightly as any steam-winch could do and picks up heavy loads quickly and in a manner that leaves no doubt that this lighter is not only able to handle any work of her capacity as well as steam-lighters, but more economically. It will be remembered that this vessel is of the following dimensions:

Length over all	133 feet
Breadth	35 feet
Draft (loaded)	10 feet
Gross tonnage	333 tons
Net tonnage	225 tons
Horsepower	200 shaft h.p.

That the 300 h.p. two-cycle airless-injection Worthington engine can equal, if not better, the reversing ability of a steam-engine is evidenced by the fact that two representatives of the marine department of one of the railroad companies, one in the pilot house and the other in the engine-room, independently and unknown to the engineer, timed a reversal from full speed ahead to full speed astern and found it to require only four seconds. A lighter must maneuver about piers so constantly that reliability and flexibility are absolutely essential and the record of the WORTHINGTON shows anywhere from a dozen to fifty bells coming to the engineer at every pier landing. She can "nose" her way into any dock that her predecessor, the steam-lighter DANIEL WEBSTER, did and operates at one-eighth of her fuel-expense.

Since going into service the WORTHINGTON has handled many heavy loads, among them being parts for a power-house installation which she took on board May 20 at Bayonne, N. J., and the Hoboken pier of the Delaware, Lackawanna & Western Railroad and delivered to the power-house at the Grand Avenue Station of the United Illuminating Company at New Haven, Conn. Our illustrations show the WORTHINGTON handling the unloading of this shipment and it will be noted that she lists very little, although the condenser-shell weighed 21 tons. It required four and one-half hours to load parts at Bayonne and then she ran for one and a half hours to Hoboken; after taking aboard the condenser-shell she ran to New Haven in a quartering 70-mile gale, requiring eight hours with 160 tons of cargo aboard. From Bayonne to New Haven she consumed 192 gallons of fuel-oil at four cents per gallon, thus costing $7.68 for the entire trip.

Another creditable performance was the work of handling, on June 20, a large shipment of shell from the Raritan Arsenal on the Raritan River to Camp Welch, Montauk Point, Long Island, for use at the Citizens' Training Camp. Another condenser-shell shipment was handled on July 8 from Newark, N. J., to the plant of the New Bedford Gas and Edison Light Company at New Bedford, Mass. This shell also weighed 21 tons and was handled with perfect control and ease.

The installation parts of the Nelseco Diesel-engines for the three tugs built by the Hiltebrandt yard at Kingston, N. Y., were also lightered from Port Newark to the shipyard early in the spring by the Worthington.

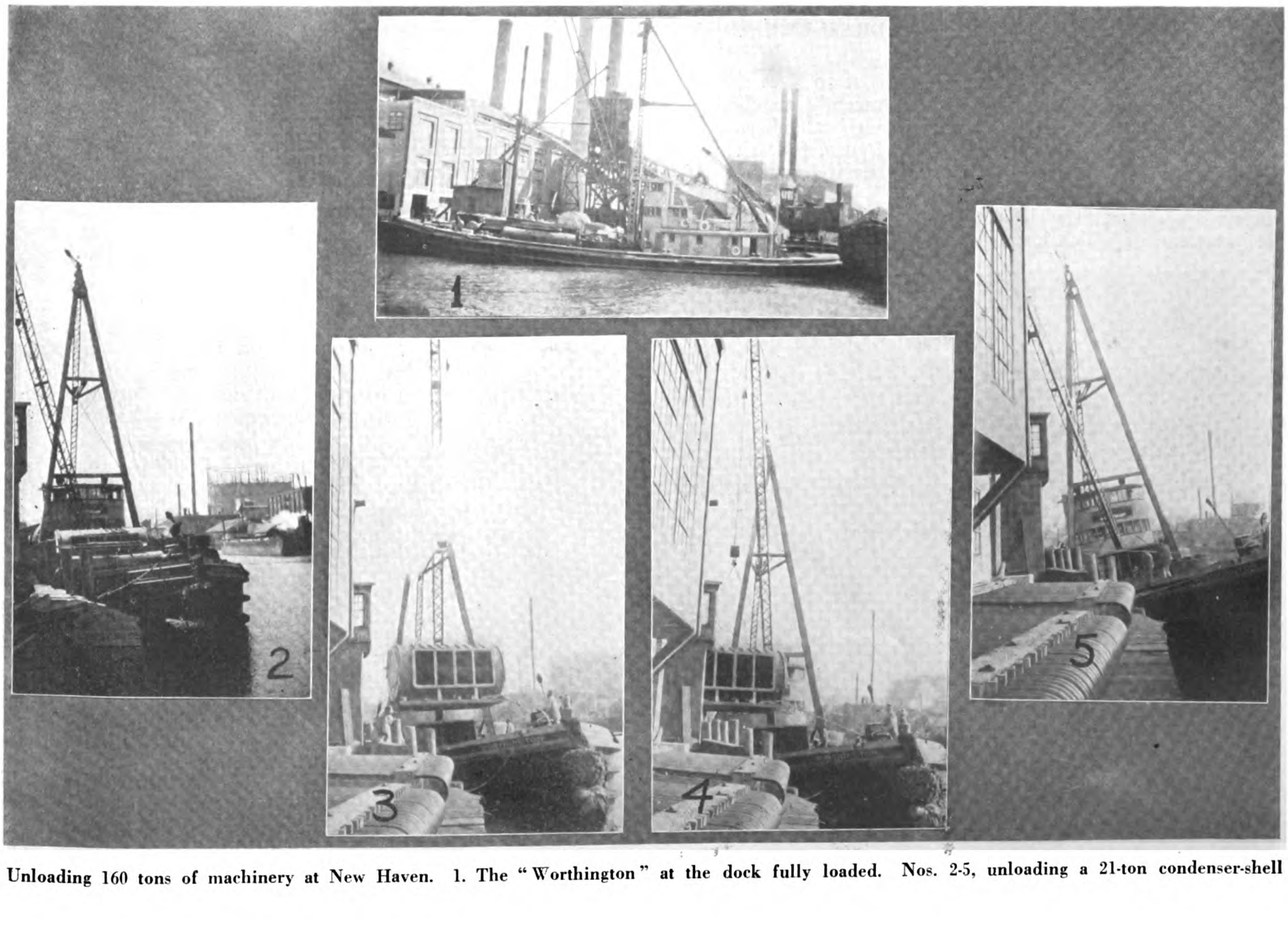
For one month, that of April, the WORTHINGTON made the following record:

Main-engine (300 h.p.) in operation	75 hrs. 31 min.
Auxiliary engine (50 h.p.) in operation	105 hrs. 50 min.
Lighting set (7 h.p.) in operation	35 hrs. 30 min.
Total fuel-oil used	1,616 gallons
Total cost of fuel at 4 cents per gal	$64.64
Cost of fuel per mile	10 cents

The following comparison between the WORTHINGTON and the DANIEL WEBSTER are exceedingly interesting:

	Steam-lighter "Daniel Webster"	*Motor-lighter "Worthington"*
Length over all	131 feet	133 feet
Breadth	28 feet	34 feet
Depth of hold	11 feet	11 ft. 9 in.
Gross tonnage	216	333
Derrick capacity (rated)	12 tons	20 tons
Horsepower	175	300
Hours under way in average month	59	75½
Fuel-cost for above operation	$410	$64.64
Fuel cost based on 59 hours operation	$410	$50.74

In addition to this economy must be mentioned the fact that the WORTHINGTON spent no time removing ashes or filling water tanks, as she only needs to take on fuel several weeks apart. Unloading or loading cargo by means of electric power is also more economical than by steam-winches and when the work is done the fuel expense stops as well. Certainly the operation of this vessel is bound to influence lighterage in no small degree.



Unloading 160 tons of machinery at New Haven. 1. The "Worthington" at the dock fully loaded. Nos. 2-5, unloading a 21-ton condenser-shell

New Design of Bolinder Engine

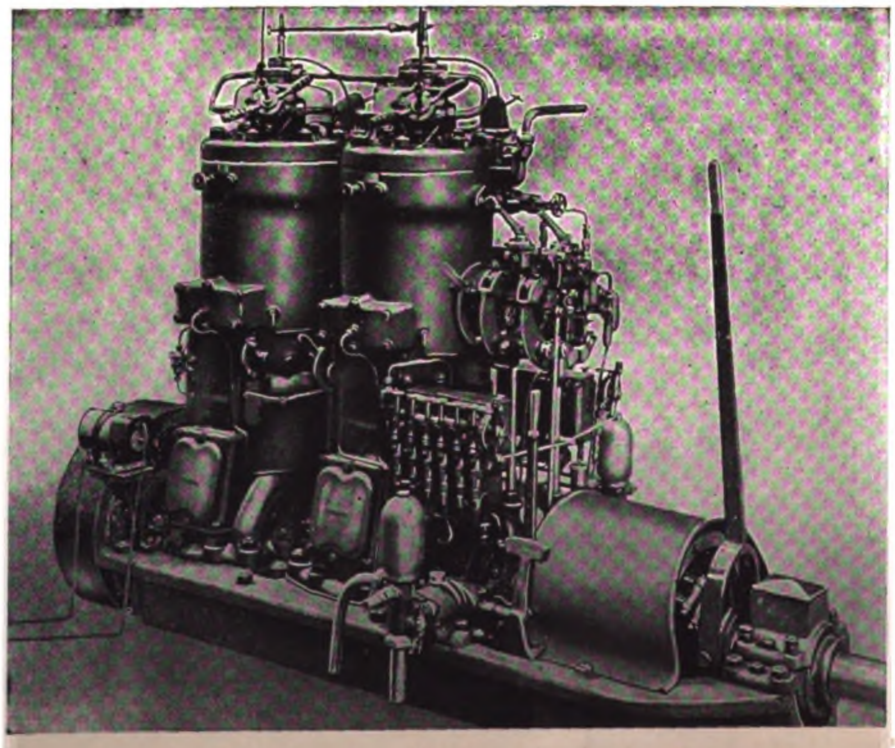
ONE of the best known surface-ignition oil engines installed in increasing numbers in work-boats all over the world is the Bolinder engine; our pages have often described these installations but the details of the latest type of this engine have not been thoroughly described in MOTORSHIP. Two of the features of their former hot-bulb type of engine which it was evident could be improved upon were the ignition-bulbs which were kept at a constant high-temperature during the operation of the engine and the injection of fresh water in the smaller and compressed-air in the larger sizes. In the latest type of Bolinder engine both fresh water and compressed-air have been eliminated, this being possible by reason of the use of a fuel-injection device, which is fitted on top of the ignition-bulb and in which the fuel is sprayed downward toward the piston. This device is simple and of only three parts, *i.e.*, the housing, the adjusting spindle and the injection-nozzle; as no springs are used, which would require adjustment or renewal, there is little to get out of order.

With this device it is also possible to operate the engine at full-load without keeping the bulbs red-hot, they being so cool that they are black; also it is possible to run the engine indefinitely without load, the bulbs retaining their heat for a long period. The spindles which adjust the ignition-device are maneuvred by a link system and a handle, a plate at the handle indicating the direction in which it should be moved from full-load to no-load, this operation requiring only a quarter-turn. In addition to eliminating the troubles experienced with water-injection and compressed-air the new device increases the power of the engine from 10 to 30 per cent., varying somewhat for cylinder sizes. Bolinder engines of the old type can be fitted with this new fuel-injection device with only comparatively inexpensive changes.

The heating of the ignition-bulbs by means of the old kerosene heating-torches required approximately 15 minutes whereas with the new electric ignition-device the engine can be started from stone cold in 15 to 20 seconds.

The device in question consists of a water-jacketed housing fitted to the ignition-bulb, which protects the igniter, fitted in a movable sleeve, the inner end of which has two openings through which the igniter is in communication with the ignition-chamber. By means of a pair of handles guided by slots in the outer part of the housing, the sleeve can be drawn out until the valve-shaped inner end of same rests against a corresponding seat in the housing. In this position the igniter is protected from the hot gases in the ignition-chamber and the valve at the inner end of the sleeve prevents the gases from leaking out through the housing. A similar valve and seating is provided for the inner position of the sleeve.

The electric-current is supplied by an electric generator mounted on a bracket, which is bolted to the engine bed plate. The generator is driven from the engine shaft by chain and sprocket, and feeds a storage battery. When the battery is charged to its capacity the current is automatically switched off until current is taken from the battery, when the generator again commences to charge same. When the engine is to be started the sleeve is moved into its inner position, the current is switched on and after 15 to 20 seconds the engine is started in the usual way by means of compressed-air. After the engine has been running under load for about 1 minute the current can be switched off and the igniter drawn out. In this last position the igniter can be entirely removed if so desired and examined while the engine is running. The storage battery can be made large enough to supply current for a few electric-lights also. This electric starting device is furnished with the engine only on special request, as in some cases there may be no real need for quick starting. All Bolinder engines can also be fitted with the electric-ignition for starting, provided, however, that they are not of too old design.



Latest type Bolinder engine which has electric-ignition for starting

DIESEL-ENGINED FISHERMAN'S LONG MAIDEN TRIP

A 90 H.P. Atlas-Imperial Diesel-engine was recently installed in Capt. J. Berntsen's fishing-boat MABEL, which operates out of San Pedro, Cal. This boat is typical of those in service on that coast and is 67 ft. long, 16 ft. 6 in. breadth and 7 ft. draft. Immediately after completion of the engine installation the fuel-tanks were filled and for three hours the boat was run around San Pedro Bay. Finding that everything worked right, the MABEL was sent on a trip of more than 800 nautical miles down the coast to fish off Cape San Lucas, the most southern point of Lower California, only stopping to transact business at Ensenada, Mexico, which long run without a stop is a tribute to the reliability of the small Diesel-engine. After three days of fishing, necessitating running at the very lowest possible number of revolutions as well as at all speeds with and without load, the MABEL returned to San Pedro without any trouble whatever.

The engineers had never had any previous experience with Diesel-engines, yet the MABEL's engine was in as good condition upon her return as when she sailed, although it ran 265 hours. On this trip the fuel-consumption was 1,009 gallons of 24 degrees Baumé fuel-oil costing $41.63, which cost was far below what was expected. She is capable of 10 knots speed. This record of economy and reliability for a new installation of a small Diesel-engine is typical of what is being done in this field.

NEWS FROM THE MOTOR WORKBOAT FIELD

The tug STIMSON, recently purchased from the Stimson Mill Co., by the Cary-Davis Tug & Barge Co., is being powered with a Diesel-engine.

A 79-90 h.p. Kahlenberg oil-engine has been installed in the Reverend Antle's missionary boat COLUMBIA which he uses along the British Columbia coast.

The ferry operated between Goble and Kalama, on Puget Sound, has been equipped with a 65 h.p. Atlas-Imperial Diesel-engine.

A 20-24 h.p. Kahlenberg engine has been ordered by Glen Elder for installation in his mail and passenger boat operating between Steilacoom and McNeil's Island, Wash.

The Pioneer Towing Co., of Seattle, Wash., is installing a 100 h.p. Fairbanks Morse oil-engine in their 50-foot tow boat RESOLUTE.

A 90 h.p. Atlas-Imperial Diesel-engine will be installed in the mail and passenger boat ESTABETH of Juneau, Alaska.

The tug ALOHA, owned by the Cascade Tug Boat Co. of Tacoma, is to have her gasolene engine replaced by a 60 h.p. Fairbanks-Morse oil-engine.

Barbare Bros., of Tacoma, Wash., have purchased a 65 h.p. Atlas-Imperial Diesel-engine which they will install in a mail and passenger boat operated between Point Roberts and Bellingham, Wash., by Waters Bros.

The Bureau of Fisheries steam tug WIGWAM has been purchased by the Rouse Towing Co. of Ballard, Wash., and her steam-plant will be replaced by a 100 h. p. Fairbanks Morse oil-engine.

A DeLaval oil-purifier has been installed on the Wilson Fisheries Atlas-Imperial Diesel-engined vessel, APEX, in the interests of economy. This has resulted in such a saving of lubricating-oil that other vessels of the fleet will be so equipped.

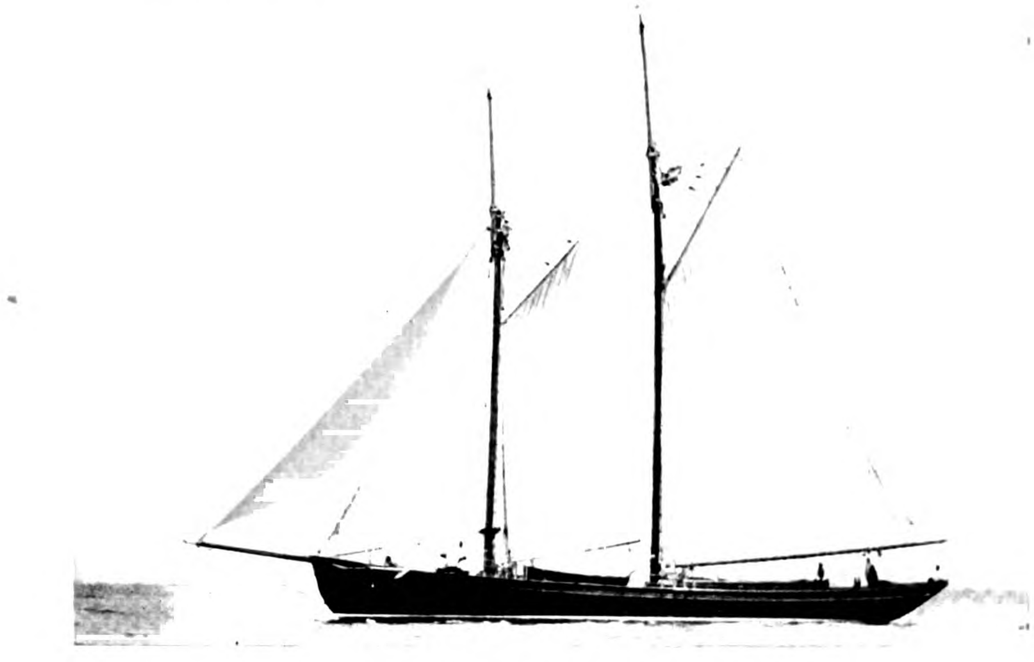
THE NEW WOLVERINE OIL-ENGINE

A test of one of the new Wolverine marine oil-engines at the plant of the Wolverine Motor Works was witnessed by a member of our staff on August 10th. A complete description of this engine will be published in MOTORSHIP for October.

NEW SCHOONER-YACHT WITH BOLINDER OIL-ENGINE

FURTHER evidence of the increased use of the oil-engine in pleasure-craft is found in the new schooner-yacht MICHABO just completed at the yard of Chas. A. Morse & Son, Thomaston, Maine, for William M. Butler of Boston, Mass. Mr. Morse made a model of the yacht as is the usual custom with the Maine shipbuilders, and John G. Alden of Boston prepared designs and superintended the construction of the vessel. She is a comfortable and seaworthy craft of the following description:

Length over all	92 ft. 6 in.
Length water line	80 ft. 0 in.
Breadth	21 ft. 3 in.
Draft	10 ft. 3 in.
Displacement	127 tons
Sail area	3,891 Sq. Ft.
Horse power	80 Brake H. P.
Estimated speed under power	8 knots



Bolinder-engined auxiliary schooner-yacht "Michabo"

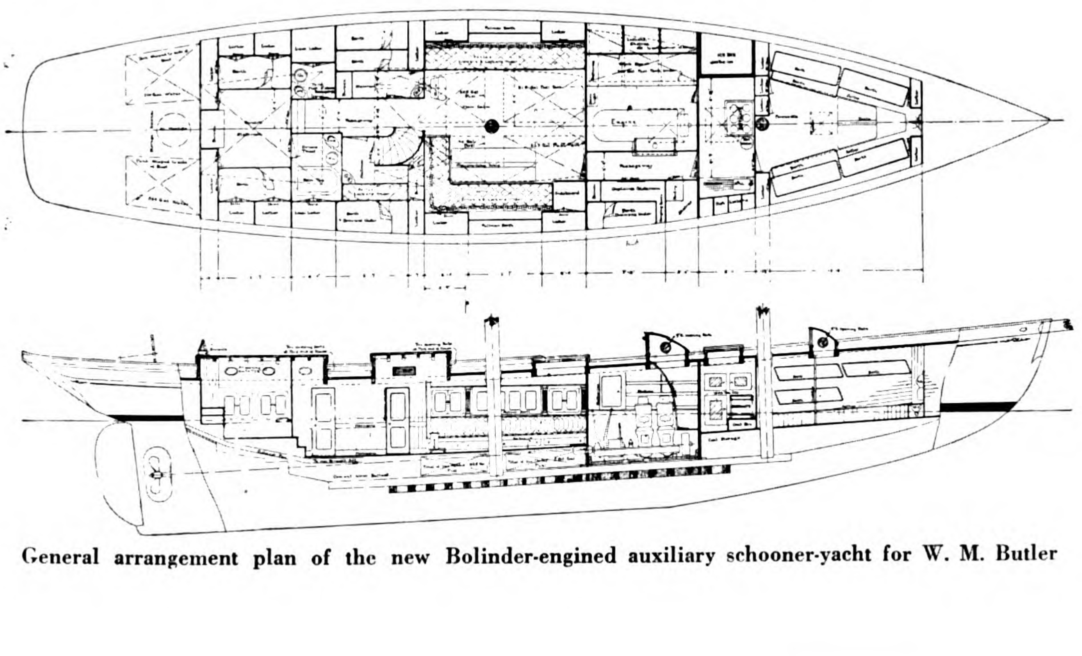
Through the courtesy of the designer we are privileged to publish arrangement plans of this attractive yacht. A glance at her under sail would almost lead one to think that she was a fishing schooner, but a study of her arrangement plan reveals a yacht's accommodations with all the comforts of a less seaworthy vessel. Whereas the fisherman type of hull and rig has been adopted the arrangement of engine-room is not as found on that type where the engine is usually installed way aft so as to allow as large fishhold as possible. In this yacht the 80 h.p. two-cylinder, two-cycle, direct-reversible Bolinder surface-ignition oil-engine is installed between double-planked bulkheads located between the fore and main masts. This engine uses neither water-injection nor air-injection for cooling the hot-bulb and is equipped with the new electric-ignition device for immediate starting from cold.

In the engine-room is a 700-gallon fuel-oil tank under a work-bench, while additional tanks under the cabin-floor hold 1,005 gallons of fuel-oil, a total of 1,705 gallons, sufficient to run the yacht for twelve days of twenty-four hours at full speed of eight knots. Such a capacity is sufficient to permit the longest of yachting cruises, both coastwise and deep-sea, as the consumption at full-load is only 5.8 gallons of 24 to 34 degrees Baumé fuel-oil per hour. It is said that the consumption of lubricating-oil is less than one-quarter of a gallon per hour.

Elimination of noise and odor in the exhaust will be made in this installation, as these are undesirable in a yacht even though sometimes permitted in commercial installations. The installation of the engine in a compartment by itself is to be commended in any craft, especially in a yacht, as the owner and guests usually like to see the results of having an engine on board without having the engine always before them when they enter the cabin.

In addition to the fuel-tanks there are under the cabin-floor thirty tons of inside ballast, while fifteen tons are carried on the keel outside. Fresh-water tanks holding 1,000 gallons are installed aft. A Columbian bronze propeller of 44 in. diameter and 32 in. pitch will drive the yacht, and when she is under sail-power the propeller will revolve freely to suit the speed of the yacht.

The reversing-mechanism of this Bolinder engine is worthy of mention for the benefit of those who have not read previous descriptions. Simple and positive, this mechanism is based upon the pre-ignition principle; after first disconnecting the propeller-shaft by throwing out the clutch, a hand-lever is moved ahead or astern as the case may be, the engine automatically slowing down before receiving the "back-stroke" from the reversing-pump, whereupon the main fuel-pump again comes into action in the opposite direction. Then the propeller is thrown into action, the whole operation of reversing taking but a few seconds. In addition to the main propelling-engine there is a windlass for hoisting anchors and a sail-hoisting winch, both driven by shafting and gearing off the hub of the flywheel of the former. Electric lights are provided by a separate plant, although in emergency the twelve-volt generator for the electric-ignition of the engine can take care of a half-dozen lights scattered throughout the yacht. The boat was launched on May 11th, and recently went into commission at her home port, Edgartown, Mass. Mr. Butler's yacht is one of many such craft which we predict will be built to be powered with oil-engines.



General arrangement plan of the new Bolinder-engined auxiliary schooner-yacht for W. M. Butler

NEW PNEUMATIC STEERING-GEAR

The steering-gear of any ship must be rugged and positive in action, it should not be too complicated or of too many small and delicate parts which require expert care on board ship. Lack of noise and "play" are also to be desired, as both indicate wear and delay in following up the movements of the steering-wheel.

Over eighteen months ago the stern-wheel freight steamer HENDERSON of Portland, Oregon, was equipped with a pneumatic steering-gear manufactured by the Johnson-Fries Marine Construction Co. of Portland, Ore. This gear has been in constant use ever since and the efficient work which it has done suggests its use on motorships, as it seems to satisfy the requirements noted above. The HENDERSON'S equipment has not cost anything for repairs. Therefore, our readers will be interested in learning more of this steering-gear, which is capable of being operated by air, water or oil in emergency.

The air-compressor and air-bottles in the engine-room of a motorship furnish the air for operating the gear, the air being led through a single pipe line to a Y near the control-valve which is usually located in the pilot house, being of non-magnetic material, and is operated by a small handle similar to an air-brake handle on a street car. Each branch of the Y has a non-return valve to keep the air from circulating between the cylinders on account of pressure on the rudder. The two pipes connecting the Y to the control-valve are fitted with two ports which in turn connect to two other ports leading directly to the pipe-lines extending aft to the rudder-control which consists of two cylinders whose pistons are directly connected with a transverse arm immovably attached to the rudder stock. The control-valve in the pilot-house admits air to opposite ends of these cylinders, moving the rudder in the same direction the control-lever is moved. When the rudder has reached the position indicated by the lever the latter is brought amidships, which allows air to feed to both cylinders with equal pressure and holds the rudder in that position, the air forming a cushion which eliminates breakage often caused by the waves against a rudder having a rigid steering-gear.

Winton-Westinghouse Diesel-Electric Ferry for Poughkeepsie

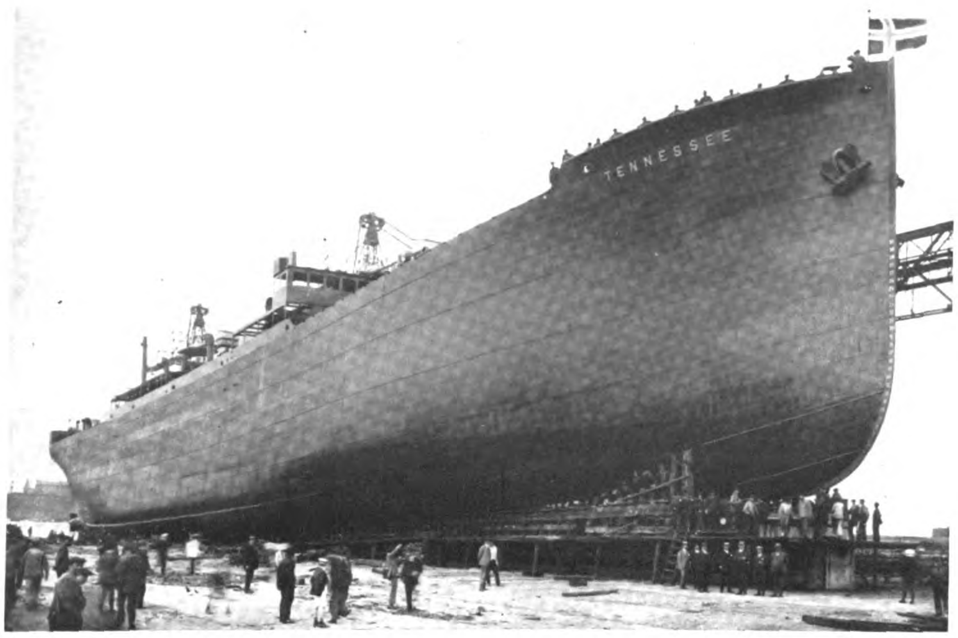
RECENTLY preliminary builders' trials were run of the POUGHKEEPSIE, which is the first ferry-vessel to be built under the "much-talked-of" Arc-construct-Hullfin principle, which apparently is a combination of the ideas of C. V. S. Wyckoff and Captain Golden. She is a vessel of 500 to 550 tons loaded displacement and for propelling power has two 150 b.h.p. Winton Diesel-engines direct connected to two 90 K.W. Westinghouse generators. The current thus generated drives two 100 b.h.p. Westinghouse electric motors each of which is coupled to a propeller shaft, one at the forward end and the other aft. On each propeller shaft there is a three-bladed 48 in. diameter by 26 in. pitch bronze propeller which the designers expected to turn up at 600 r.p.m. to propel the boat at about 10½ knots.

The vessel is owned by the Poughkeepsie and Highland Ferry Company of Poughkeepsie, Mr. S. A. Crum, president, and was built by the Atlantic, Gulf & Pacific Co.'s shipyard at Brooklyn.

It is obvious that a mistake has been made in the calculation of the power necessary to develop this vessel at 10 knots, and this error was probably due to too much confidence being placed in the theory that a vessel of the Hullfin construction would need considerably less power than a hull of regular form. Also, a 48″ x 26″ propeller at each end is obviously too large in diameter for the amount of power available at the shaft, namely 300 b.h.p., to turn at 600 r.p.m. and that smaller propellers should have been fitted, or else two motors arranged to drive one propeller at a time.

Consequently, on the preliminary trials, although the power delivered to the two propellers was as high as 288 shaft h.p. at 400 r.p.m. the vessel gave nowhere near her designed speed. To our mind two propellers of 48″ x 26″ would require at least 200 shaft h.p. per propeller to turn them at 600 r.p.m.

We understand that some changes have been made, and that the vessel is now in service on the Hudson. Following the preliminary trials some tests were made at the dock with a view to ascertaining the exact amount of power developed by the Winton-Westinghouse machinery and it was found that all guarantees were exceeded by 44 per cent. So it is obvious that the failure of this vessel to attain the desired speed can in no way be put down to the machinery.



Wilhelm Wilhelmsen's new Burmeister & Wain motorship "Tennessee" ready for launching

Profitable Operation of a Converted Sub-Chaser

THE accompanying illustration of the CICO shows one of the well known U. S. 110′ submarine chasers of which several hundred were built during the war, equipped with three 220 h.p. gasoline engines. The CICO was purchased by the Consumers' Ice Co. of Crisfield, Md., from the Navy Department, and after removing the center engine and overhauling the two wing engines, the boat was operated for some time. However, the cost of fuel proved prohibitive and these gasoline engines were removed and two 60 h.p. Fairbanks-Morse surface-ignition oil-engines were installed. After several months' operation the owners report that the boat is most economical and has proved a profitable investment, carrying about 100 tons of general cargo on Chesapeake Bay.

By referring to the plans of the U. S. 110 ft. Submarine Chasers on page 886 of the November, 1921, issue of MOTORSHIP the general layout of this craft will be readily seen. In converting the former S. C. 425 to commercial service two of the original three 220 h.p. gasoline engines and the auxiliaries contained between the two steel engine-room bulkheads were left intact, while forward of the engine-room a forecastle for five men and a 35 ft. hold with a capacity of about 70 tons were provided. The galley way aft was retained and forward of this was provided a 20 ft. hold for about 35 tons of cargo. The centre engine, shaft strut and propeller were removed.

With the two gasoline-engines, the CICO made 16 knots light and 11 to 12 knots loaded. These two engines consumed 22 gallons per hour each (total of 44 gallons per hour) at a cost of 25 cents per gallon which was a fuel cost of $11.00 per hour. As the CICO when loaded could not run at high speed, but ran between 11 and 12 knots, this cost, added to a cost of 82½ cents an hour for 1½ gallons of Polarine cylinder oil at 55 cents, was prohibitive and it was decided to convert her to oil engine power.

Two 60 h.p. Fairbanks Morse surface-ignition oil-engines were immediately installed in place of the gasoline-engines, but the gasoline-engine-driven auxiliary electric-generating set, batteries, switchboard, air-tanks and lubricating-oil tanks were retained. The fuel oil tank holding 600 gallons is located just forward of the engine-room in the aft end of the forward hold. These oil-engines now turn 36″ diameter by 42″ pitch Columbian bronze propellers which drive the CICO better than 11 knots loaded on a fuel-consumption of 9 gallons of 38 degree Baumé paraffin-base oil costing 6½ cents per gallon, furnished by the Pure Oil Co. of Philadelphia.

The following comparison vividly indicates the results of this conversion from the financial standpoint and to this economy must be added the fact that the CICO utilities fuel which is always at hand, this being gas-oil used at the Crisfield gas plant in making gas, so that special fuel does not have to be purchased.

	Before Conversion	After Conversion
Gasoline (44 gals. @ 25c.).......	$11.00	
Fuel-oil (9 gals. @ 6½c.)........		$0.59
Lubricating-oil. (1½ gals. @ 55c.).	0.83	
Lubricating-oil (1½ gals. @ 42c.).		0.63
Total cost	$11.83	$1.22
	1.22	
Saving	$10.61	

With such economy a proven fact, Chief Engineer Krest of the CICO writes: "Why do not all work-boat owners make up their minds to save money on small cargoes by dispensing with gasoline-motors and using oil-engines. They will not only save in fuel-expense, but will save at least 85 per cent of engine trouble and expensive repair-shop bills."

The CICO carries 85 to 95 long tons of ice and coal each trip from Crisfield to Norfolk, Va., making two trips per week, each being about 85 miles, which is covered in about 7 hours on the average.

FROM GASOLENE TO OIL INCREASES PROFITS

The trawler, INTERNATIONAL No. 3, owned by the International Fish Co. of San Francisco, Calif., has proven itself not only more economical but faster since the 85 h.p. distillate engine was removed and the 90 h.p. Atlas-Imperial Diesel-engine installed. The propeller of 48″ diameter and 44″ pitch was not removed. With the distillate engine the r.p.m. was 275, whereas with the Atlas-Imperial Diesel-engine the revolutions are now 322 and the speed of the boat has been increased from 8.5 knots to 11 knots, although the increase in h.p. was not great.

Converted submarine-chaser "Cico," now a successful coal and ice carrier

The new Swedish-American-Mexico Line motorship "Trolleholm" on her trial-trip

Three New Burmeister & Wain Motorships

Trials of the "Trolleholm" and the "Thalatta" and Launching of the "Tennessee"

IT has often been mentioned in MOTORSHIP that, unlike steamships, many Diesel-driven craft go immediately into commission upon the completion of their trial-trips and in the TROLLEHOLM just completed for the Swedish Mexico Gulf Line we have another instance of this practice. She ran trials on July 15th, after having had her two six-cylinder four-cycle 1050 h.p. Burmeister & Wain Diesel-engines installed at their works, the hull having been built at Kockum's shipyard, Malmö, Sweden. She left for Galveston, Texas, and New Orleans, La., after trials. This vessel is a sister-ship of the ARATOR built by Kockum's yard for the Swedish Farmers' Shipping Co., Ltd., and is rigged with two masts, wireless, and has a hull of the rounded cruiser-stern type which seems to be so much in vogue among European shipbuilders. Her dimensions are as follows:

Length, b.p.	370' 0"
Breadth, moulded	51' 3"
Draft, loaded	24' 8½"
Displacement, loaded	10,450 tons
Displacement, light	2,915 tons
Deadweight capacity	7,535 tons
Ship's speed, loaded	10½ knots
Cruising radius	45,000 n. miles
Fuel-capacity	
Double bottom	1,044 tons
Deep tank	184 tons
Total	1,228 tons
Horse power, indicated	21,000
Revolutions	150 r.p.m.
Daily fuel-consumption	7 tons
Engine-room crew	12 men

In addition to her two 1050 h.p. 540 mm. (21.25") bore by 730 mm. (28.74") stroke propelling engines she has three 75 h.p. Burmeister & Wain Diesel-electric generating-sets, furnishing current for lights, steering-gear, cargo winches and windlass, as well as for the electric-driven auxiliary air-compressor and the circulating-water, lubricating-oil, bilge and sanitary pumps. The trial data will be found below in the table.

On July 29th THALATTA, the second of the three motorships ordered by Wilhelm Wilhelmsen, of Tonsberg, Norway, from Burmeister & Wain ran trials off Copenhagen, Denmark. She is a sister-ship to the TENERIFFA, which was described in the July issue of MOTORSHIP on page 525 and the particulars given there apply to the THALATTA. At the request of the owners a stock was fitted on which to display house-colors and advantage is taken of the stack to enclose water tanks and exhausts. She has three masts carrying twelve steel derricks, one of 25 tons, one of 10 tons and ten of 5 tons lifting-capacity, all served by Asea electric cargo-winches. In addition to a Sabroe refrigerating-plant there is a Clark Chapman electric-windlass and a John Hastie steering-gear.

In the following table are incorporated the trial-results of the THALATTA, as well as of the TROLLEHOLM and the BINTANG, which vessel was illustrated and described in the July issue of MOTORSHIP on page 517. These trials were run in very stormy weather off the island of Hven, the fact that there was a difference of four nautical miles between the speed with and against the wind indicating this. The BINGTANG has arrived at Bangkok, Siam, and take up her coastwise work. The following is the table of comparison of these three Burmeister & Wain-engined vessels:

	Bitang	*Trolleholm*	*Thalatta*
Draft, mean	8'-9"	9'-4¾"	9'-6"
Displacement	2230 tons	3635 tons	4345 tons
Mean indicated Horse-power over measured mile	1432	2376	3174.5
Mean Revolutions	152.4 r.p.m.	159.5 r.p.m.	137.25 r.p.m.
Mean Speed	10.44 knots	11.73 knots	13.72 knots
Indicated h. p. during fuel-consump. test	1418	2299	3178
Fuel-consumption per i h. p./hr	148 grams (0.32 lb.)	137.08 grams (0.29 lb.)	138.92 grams (0.30 lb.)
Calorific value of fuel	10,170	10,201	....
R. P. M. during fuel-consumption test	148	156.5	137.2

On August 1st there was launched from the Burmeister & Wain yard another motorship similar to the THALATTA and TENERIFFA, this being the TENNESSEE, which was built for Wilhelm Wilhelmsen's Norway-Africa-Australia Line. A view of this launching is shown elsewhere in this issue of MOTORSHIP.

TWO STEAMSHIP COMPANIES ADOPT MOTORSHIPS

About a year ago the Bergenske Steamship Co., of Bergen, Norway, purchased the Burmeister & Wain-engined ship COMETA which had been built for the North Star Co. (Johnson Line) of Stockholm, Sweden. Therefore, it is not surprising to learn that the Bergenske Steamship Co. has ordered two 6,500-ton motorships from Burmeister & Wain. The keel of the first vessel has been laid on the ways which were occupied by the THALATTA.

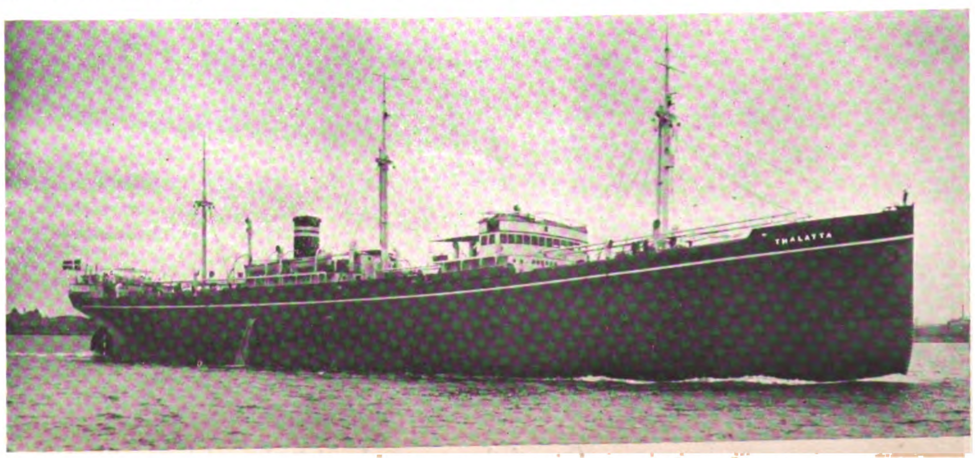
The Nordenfjeldske Steamship Co., of Trondhjem, Norway, has ordered two 8,000-ton motorships, the details of which are not made public as yet.

A CHANGE OF NAME

The Brunswick Refrigerating Co. of New Brunswick, N. J., and Kroeschell Bros. Ice Machine Co., Chicago, were combined under the name of the Brunswick-Kroeschell Co., with main offices at New Brunswick.

NEW FISHING-VESSEL

Capt. Louis Kunze of Elizabeth, N. J., has ordered a party fishing-boat from designs by William H. Millett of Bayonne, N. J., to be built by the Heckman Craft Shop, Kennebunkport, Maine. She will be powered with a 100 h.p. Fairbanks-Morse oil-engine.



New motorship "Thalatta" running trials off Copenhagen

"BLACK SWAN," A NEW PACIFIC COAST DIESEL YACHT

PROBABLY the tremendous success of the Diesel-engine in commercial craft on the Pacific Coast has had considerable effect upon yachtsmen there and has been partly responsible for their adopting such engines for their pleasure-craft. That this is in line with progress is clearly evident if one considers the advantages of Diesel-power for yachts, eliminating as it does the heat, large engine-room crew, dirt and soot which penetrates into the clean staterooms and soils the clothes of the owner and guests on the steam yacht. Diesel-engines are more safe than gasoline-engines, while the cost of operation of the former is but a small fraction of the cost of gasoline. Kerosene-engines are not popular on yachts because of the odor and the creeping-qualities of kerosene, which finds its way all over a boat. It is not surprising, then, that when men of means consider a motor-yacht to-day that they adopt and install Diesel-engines; a few years ago such yacht-installations were not so highly perfected as they are to-day, but now the efficiency and economy of Diesel-power, once realized, is being generally adopted. Among these installations is the BLACK SWAN.

This 130-foot, Diesel-engined yacht was built by William Cryer and Son of Alameda, California, for R. C. Durant the automobile manufacturer, and was put in commission August 1 then immediately taken to San Diego on a cruise. She is the largest and finest yacht of her kind on the Pacific Coast and is driven by two specially built six-cylinder Atlas-Imperial airless-injection Diesel engines developing 200 b.h.p. apiece.

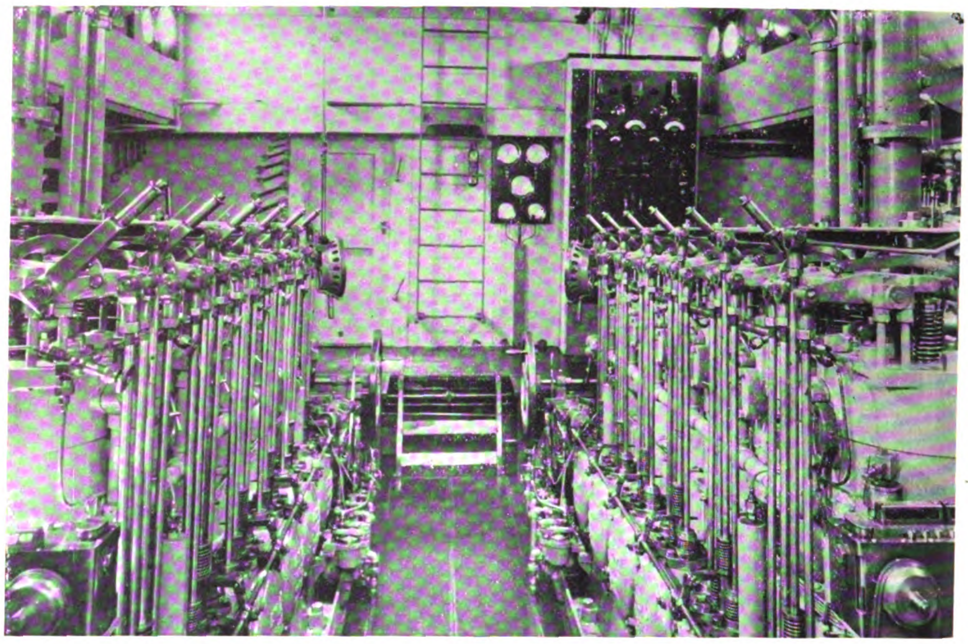
The BLACK SWAN has a beam of 22 feet, draws six feet of water. Her net tonnage is 100 and the fuel-oil tanks, which have a capacity of 7,500 gallons, run almost the entire length of the ship under the flooring. This gives her a large cruising radius. She made 15 miles an hour on her trials on a low fuel consumption.

Finishings are in mahogany throughout and there are four staterooms, furnishing accommodations for about a dozen guests. Forward there are quarters for nine members of the crew. There is a combined pilot-house, wireless-room and captain's quarters, a sun-parlor on the forward deck, a main dining-room below and an awning covering the entire open portion of the deck. The fresh water tanks, which hold 2,500 gallons, are located under the after deck. The yacht has two separate General Electric units for generating sets, these being operated by gasoline-driven Atlas motors. There are two electric winches, one forward and the other aft, for hoisting the anchors. There is also a refrigerating plant and a steam-boiler in the galley to furnish heat by hot-water circulation. The engine-room occupies a space 18′ by 22′. There is a Marconi wireless set.

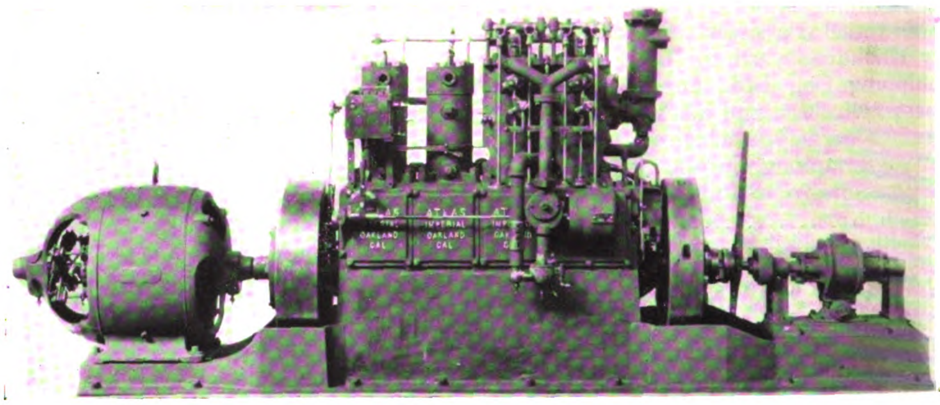
Her steering-wheel is mounted in a specially designed binnacle made by Allan Cunningham Co. and her electric-capstan is also of a special type made by the same company. The cleanliness and efficiency of electric-auxiliaries are particularly appreciated on such craft as the BLACK SWAN.

The crew consists of a captain, first-mate, chief-engineer and one assistant, a wireless operator, cook, butler and two deckhands.

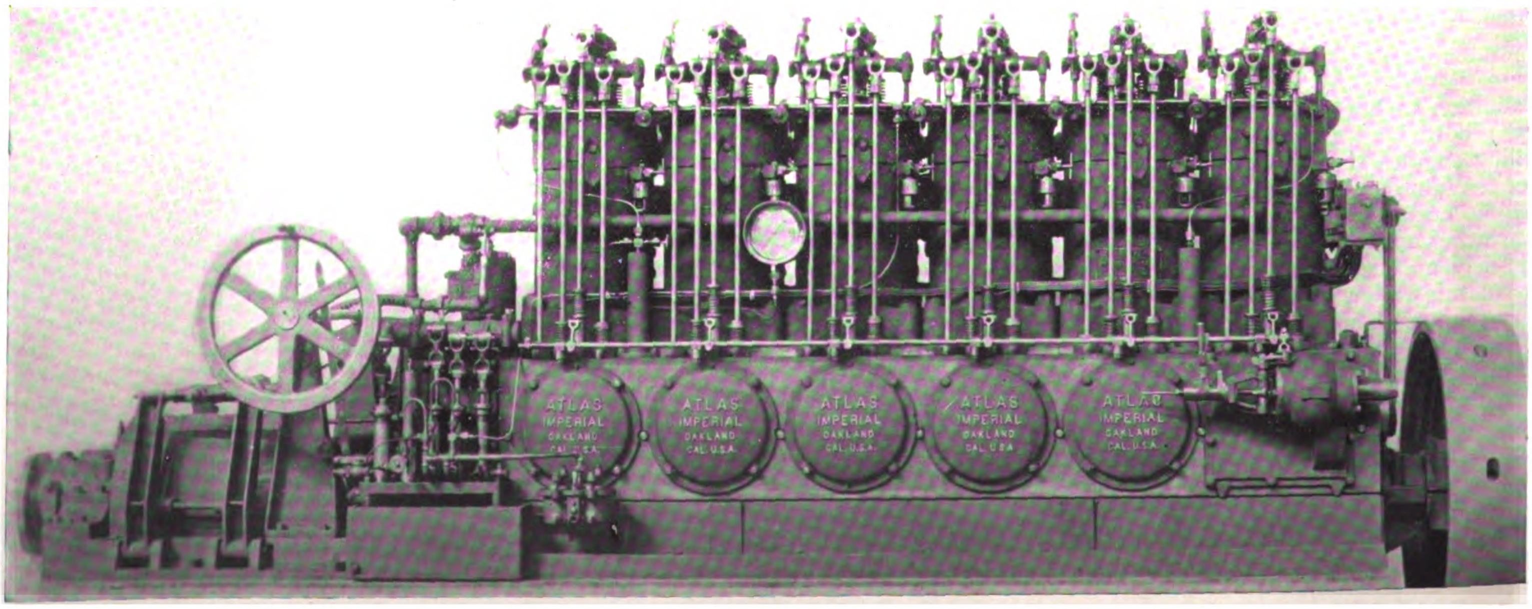
R. C. Durant's Diesel-yacht "Black Swan"



Engine-room of the "Black Swan"



One of the Atlas-Imperial Auxiliary Sets of the "Black Swan"



One of the six-cylinder Atlas-Imperial Diesel-engines of the "Black Swan"

Testing a 1000 Shaft H. P. Marine Oil Engine

IF it were possible to compile statistics on the amount of time and study which is devoted to the various technical aspects of the marine oil-engine, it would probably be found that to-day the problems connected with the two-stroke engine are more predominant in the minds of the designers and engineers than anything else. Without entering into the controversy of two-stroke and four-stroke engines, one cannot help but think that the two-stroke engine has certain redeeming features which are accentuated when the two-stroke cycle is applied to the opposed-piston type. We are not prepared to go as far as to state that the absence of cylinder heads is entirely responsible for the present popularity of the opposed-piston engine. There are other advantageous features which are of considerable use to the designer and of practical value to the shipowner.

The "Camellaird-Fullagar" Diesel engine falls in this category and its general lay-out, design and construction as applied to both marine and stationary purposes is well known to all engineers. Cammell Laird & Co. have recently completed a very searching series of tests on one of their standard 1,000 shaft b.h.p. engines. The total running period covers about five weeks and the tests have been carried out in order to obtain data mainly on the following points:

1. The endurance and reliability of the engine.
2. The fuel-consumption and thermo-dynamic conditions in the engine under varying conditions.
3. The ability of the engine to operate under conditions such as are usually found in tropical seas.
4. The ability of the engine to operate successfully on ordinary boiler-fuel oils.

Everyone will admire the ambitious scheme which Cammell Laird & Co. have set themselves and we feel sure that the following published data will be received with great interest, not only by every student of the two-stroke engine but by shipowners in general.

The "Camellaird-Fullagar" oil-engine in connection with the installation on board the motorship MALIA has been described previously, and broadly speaking the 1,000 h.p. standard unit follows the design of the original 500 h.p. sets. The main scantlings of the large size were fixed up some three years ago, and as the quantities of scavenge-air and blast-injection air have been reduced and furthermore as the combustion chambers have been improved in this design, the makers are justified in anticipating an improvement on the results hitherto obtained. The valve gear is the same as that used with the 500 h.p. engine, although it will be remembered that the construction can be somewhat simplified by abolishing the camshaft and operating the fuel and starting valves by push-rods worked direct off the crankshaft by means of eccentrics and levers.

Considerable attention has been paid to the design and construction of cylinder liners as used for the opposed-piston engine. Although it may be thought that the excellent symmetry and uniformity of the liner castings called for no special attention from the metallurgical point of view, it has been found that under practical conditions these liners are not immune from cracking unless due precautions are taken as regards the mixture of metal and method of casting. The starboard engine on board the MALIA experienced a breakdown owing to a cracked cylinder-liner, the crack starting from the fuel-valve orifice in the combustion chamber proper and spreading in both directions to the scavenging and exhaust ports

Builders of the "Camellaird-Fullagar" Diesel Engine Release Some Most Interesting Information

(From Our British Technical Correspondent)

respectively. Investigations proved that the fault lay with an unsuitable mixture and an analysis prepared by Mr. W. Ramsey showed certain data which proved the mixture unsuitable in the face of current practice.

In Table No. 1 we have compiled a number of figures to enable a comparison to be made with the defective liner and what is considered as a suitable mixture for oil-engine liner castings by various authorities.

TABLE No. I.

CAST-IRON SPECIFICATIONS FOR OIL-ENGINE LINERS.

	Cammell Laird defective Liner	Suggested by F. J. Cook	Suggested by A. E. L. Chorlton	Suggested by H. Moore	Used by Deutz
Combined Carbon...	0.09	3 to 3.2	3.2	0.2	0.2
Graphite...	2.40			3.2	3
Silicon.....	2.64	1 to 1.2	1.11	1.4	1.7
Phosphorus.	0.7	Not over 1	0.56	0.4	0.7
Sulphur....	0.06	0.12	0.10	0.08	0.12
Manganese..	0.50	Not over 0.5	0.56	0.6	0.5

It will be observed that the Silicon percentage in the defective liner is very high and the breakdown emphasises the importance of submitting test bars to the usual standard tests to insure the liner being of suitable material.

The seven days' non-stop endurance trial was run from the 6th to 13th of February, 1922, and constitutes the answer to the first item on the research program. The average results for the whole run and also the results obtained with the best fuel consumption are recorded in Table No. II attached. Tests on a similar engine have already been published and will be remembered that the fuel consumption of 0.39 lb. per b.h.p. hour was obtained. A comparison of the fuel-oil analyses will prove that in the previous case the calorific value of the oil was somewhat higher. The fuel used in this test was Anglo-American Diesel Oil having the following specification:

Specific Gravity.............0.885 (28.5 Baume)
Flash Point.................182°F.
Calorific Value, Nett.........18,070 B.Th.U's. per lb.

On completion of this trial the pistons were removed for inspection purposes and were found to be clean and in good condition. The same remarks apply to the liner and ports.

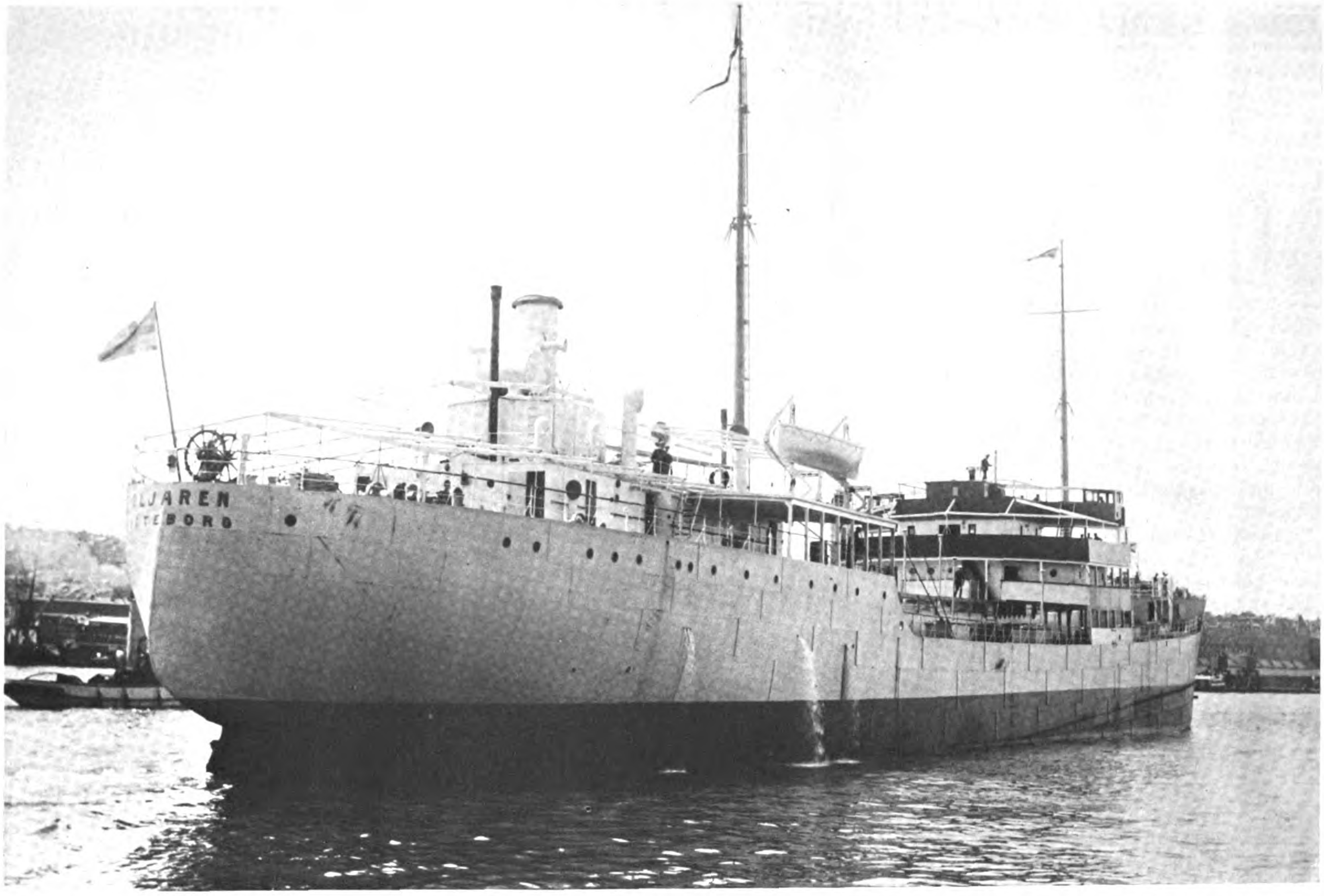
(To be continued in our October issue.)

TABLE No. II.

ENGINE No. 2027—STARBOARD

Four Cylinders—Pistons 18½" diameter x 25" stroke.

	7 Days' Non-Stop Trial. 6th-13th February, 1922. Average Results.	Results at best Fuel Consumption.	*3 Days' Trial Under Tropical Conditions.* Average Results.	Results at best Fuel Consumption.
R.P.M.	120.3	122.0	119.4	119.3
S.H.P.	1023.0	1001.0	1050.0	1050.0
I.H.P.	1497.0	1450.0	1477	1490
M.E.P. (S.H.P.) Lbs. per sq. inch	62.7	60.5	64.75	64.8
Mean of M.E.Ps. (I.H.P.)				
Lower Pistons—Lbs. per sq. inch	100.4	95.65	99.8	100.5
Upper Pistons—Lbs. per dq. inch	86.4	82.35	....	....
Mechanical Efficiency	68.5%	69.1%	71.7%	70.5%
Fuel Consumption—				
Lbs. per I.H.P. /hour	0.273	0.271	0.297	0.287
Lbs. per S.H.P. /hour	0.398	0.392	0.417	0.408
Scavenge Pumps—Mean of M.E.Ps.				
Lbs. per sq. inch	2.77	2.62	3.02	2.85
Scavenge Pumps—I.H.P	77.5	74.3	81.2	83
Air Compressor—M.E.P. 1st stage	9.64	10.5	11.36	11.9
M.E.P. 2nd stage	72.60	72.75	77.60	81.4
M.E.P. 3rd stage	364.0	337.5	369.5	365.0
Air Compressor—I.H.P. 1st stage	19.60	21.65	22.9	24.0
I.H.P. 2nd stage	32.7	33.2	34.7	36.4
I.H.P. 3rd stage	33.7	31.4	33.7	33.2
Total Compressor I.H.P.	86.0	86.25	91.3	93.6
Pressures—Lbs. per sq. inch.				
Compressor 1st stage	27.75	28.0	30.6	32.0
2nd stage	157.0	150.0	170.5	175.0
3rd stage blast pressure	912.0	900.0	996.0	1000.0
Scavenge Air	1.82	1.75	1.24	1.25
Lubricating Oil	15.5	15.0	14.75	15.0
Circulating Water	12.5	12.0	20.25	19.0
Temperatures—Degrees F.				
Atmosphere	42.7	48.0	49.2	49.0
Air—				
Scavenge Pumps Inlet	.....	.....	102.3	102.0
Scavenge Pumps Outlet	77.6	80.0	136.1	133.0
Compressor 1st stage inlet	.....	.....	139.4	140.0
Compressor 1st stage before cooler	138.2	146.0	209.0	212.0
Compressor 1st stage after cooler	.....	.....	165.0	167.0
Compressor 2nd stage before cooler	200.5	208.0	193.2	192.0
Compressor 2nd stage after cooler	.....	.....	120.7	123.0
Compressor 3rd stage before cooler	223.5	226.0	311.0	312.0
Compressor 3rd stage after cooler	.....	.....	164.9	163.0
Oil.				
1st Oil Cooler Inlet	118.7	124.0	128.3	128.0
2nd Oil Cooler Outlet	110.0	108.0	114.0	115.0
Mean of Piston Outlets	130.5	134.0	146.0	144.7
Crankcase Oil	91.6	94.0	99.6	99.0
Water—				
Jacket Inlet	64.4	70.0	91.8	92.0
Mean of Jacket Outlets	102.7	108.25	150.8	150.0
1st Oil Cooler Outlet	73.5	74.0	102.2	107.0
2nd Oil Cooler Outlet	....	....	107.8	114.0
Exhaust Temperature	....	....	562.0	561.0



Transatlantic Co.'s new Götaverken-built fuel-supply motor-tanker "Oljaren." She is propelled by Götaverken-Burmeister & Wain Diesel engines

Motorship Owner's Fuel-Supply Ship

"Oljaren," a New 7,500-tons Götaverken-B. & W. Engined Tanker for the Transatlantic Company

A NUMBER of European motorship owners, faced with the stumbling block of no natural local supplies of oil, have recently built tankers to ensure of a constant supply at reasonable prices for their vessels. To make certain that transportation costs do not come too high and with a view to securing transportation of oil as cheaply as, or cheaper than, the oil companies, they have adopted Diesel-power for such vessels.

The OLJAREN, built by Aktiebolaget Götaverken, Göteborg, Sweden, for the Transatlantic Steamship Co., of the same port, is the second Diesel-driven tanker launched from the Götaverken's yard. She is somewhat similar to HAMLET, delivered in 1916, and made her trials on June 2d last. But the HAMLET has Polar two-cycle engines, whereas the OLJAREN has Burmeister & Wain type four-cycle motors.

The OLJAREN is built to the highest class of British Lloyds and is constructed on the Isherwood system. Her principal dimensions are as follows:

Length (o.a.)	394' 3"
Length (b.p.)	380' 3"
Breadth (moulded)	55' 0"
Depth to main deck	30' 0"
Draught	24' 1"
D.W. capacity	7,500 tons

The vessel is of the single-deck type with trunk and will have two steel pole-masts with cargo booms. The deck machinery, as well as the steering-engine and cargo-pumps, are electrically driven. A double bottom is fitted under the machinery space carrying 162 tons of fuel-oil, 18 tons of lubricating-oil and 46 tons of fresh water, while 400 tons of fuel-oil also will be carried in the after-peak tank. The pump-room is situated next forward of the machinery space, and the cargo-space forward of the pump-room is divided into seven main cargo-centre tanks and four wing-tanks at each side of the vessel with a cofferdam at the forward end. There is also a cofferdam separating centre tanks Nos. 3 and 4 and the two forward and two aft wing-tanks. The fore peak-tank will be fitted and piped for water-ballast. A cargo-hold is fitted forward next to the collision bulkhead; in this cargo-hold there is a small pump-room fitted with an electrically driven ballast and bilge-pump.

The deck officers' quarters are placed in the deck house amidships, while the engineers' quarters and the crews' spaces will be located under the poop-deck aft.

The propelling machinery consists of two 1,300 i.h.p. six-cylinder Götaverken-Burmeister & Wain Diesel-engines of the four-cycle type, with cylinders having 23.23 in. bore by 35.43 in. stroke running at 130 r.p.m. and the speed is calculated at 11 knots. These are thoroughly standardized sets, of which numerous types are now in service.

During the trials the engines developed 2,768 i.h.p., at an average of 132 r.p.m., giving the vessel a mean speed of 12.55 knots. The displacement at the time of the trials was 6,000 tons, the draught being 12 ft. 0 in. forward and 17 ft. 0 in. aft.

For driving the electric generators three 75 b.h.p. Götaverken's B. & W. Diesel-engines are installed in the engine-room, direct connected to 50 k.w. 220 volt d.c. generators, 325 r.p.m. There are two motor-driven circulating-pumps arranged to draw from sea on each side of the ship and to discharge to the main engines and auxiliary circulating lines.

One motor-driven ballast-wing pump with a capacity of 150 tons per hour is arranged to draw from sea, bilges, engine-room and double bottom and to discharge to the after-peak tank and over board. There are two motor-driven sets of bilge and sanitary-pumps.

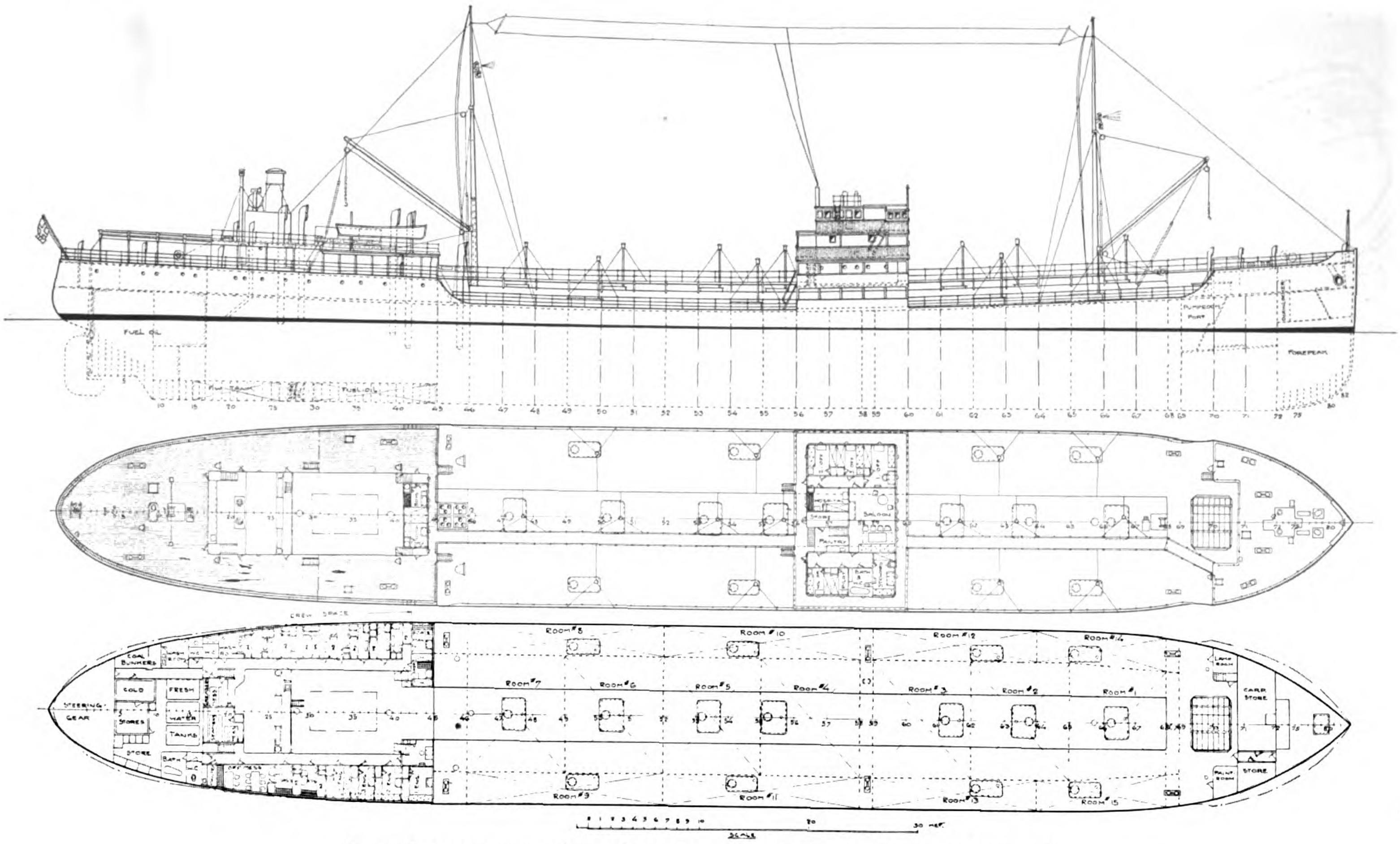
One air-compressor direct-connected to a 90 h.p. electric-motor is arranged to discharge into the maneuvring tanks at 350 lbs. pressure, and one steam-driven auxiliary air-compressor is arranged to deliver full pressure of 850 lbs. per sq. in. to the injection-air bottles of the engine.

There are two sets of lubricating-oil pumps, motor-driven, arranged to draw from the lubricating-oil drain-tanks and to discharge through the lubricating-oil coolers to the main and auxiliary engines. One 15 h.p. electric motor drives a fuel-oil service-pump, which is arranged to draw from the engine-room double-bottom and from the after-peak tank and after cofferdam and to discharge to the daily fuel service tanks.

In the pump-room there are two cargo-pumps of the centrifugal type, each with a capacity of 250 tons per hour, and one plunger-pump with a capacity of 100 tons per hour. The electric motors driving these pumps are located in the engine-room and they are connected to the pumps by means of a shaft running through the dividing bulkhead.

For ventilation of the cargo-tanks a Sirocco-fan of Götaverken's make is fitted in the pump-room, arranged to take suction through 11 in. ventilator and discharge into the suction lines of the cargo-tanks and even to take suction from the cargo tanks through the suction lines and discharge to the air through the before-mentioned 11 in. ventilator.

There are two boilers fitted, one in the engine-room of the cross-tube type with 100



General arrangement plans of the Götaverken-built Diesel-tanker "Oljaren"

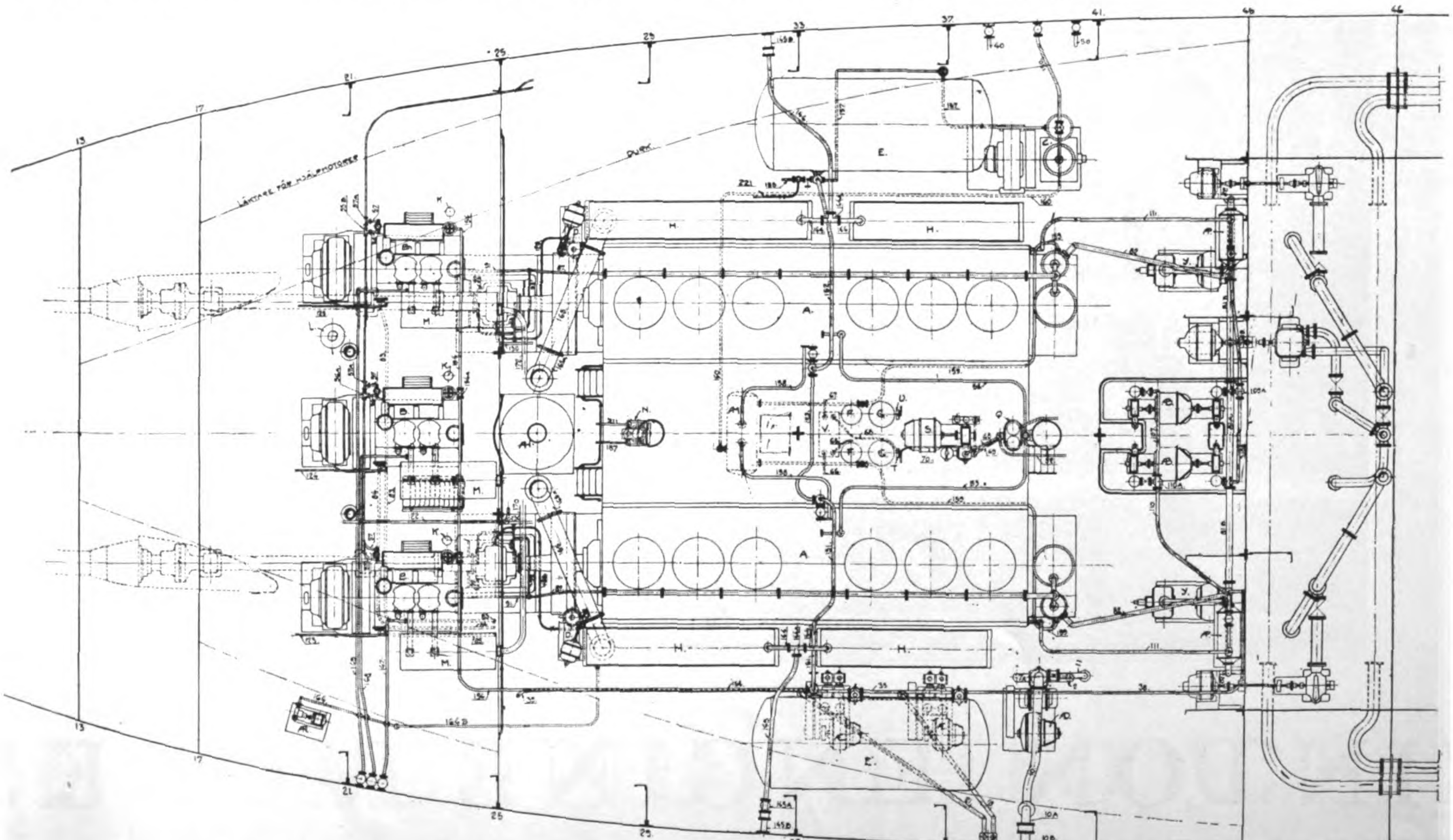
square feet heating surface, and one Cochran boiler with 500 square feet heating surface, located on the main deck in a separate room aft of the engine-room casing. The boilers are designed for oil-burning. The smaller boiler is provided for the heating-apparatus, heating coil in the aft-peak tank, distiller, auxiliary air-compressor, donkey-boiler feed-water pump, injector and oil-burning apparatus. The Cochran boiler is connected to the cargo-oil-tank steaming out lines.

The main steaming-out line will run forward under the flying bridge, with branches to all main cargo-tanks and cofferdams, the steam to be got in directly at the top of the trunks for the purpose of using steam as a fire extinguisher in case of necessity.

The fuel-oil service-tanks to be three in number, of which two have a capacity of 43 barrels each and one a capacity of 6 barrels. For the cold storage department there will be one Ludwigsberg's refrigerator set, located in the engine-room. The cargo tanks are fitted with Pneumercator gauges for convenient and quick measuring of the contents of the tanks.

CONTRACT FOR THE SUN CO.

The contract for the conversion of the Munson Line's two recently acquired Lake-type 4,200 ton freighters COURTOES and COREDALE has been awarded to the Sun Shipbuilding Co. In each boat a McIntosh & Seymour Diesel engine of 900 shaft h.p. driving a new four-blade 12′ dia. by 8′ pitch propeller at 140 r.p.m. and electric-drive will be installed. The conversion work will cost about $50,000 per ship. The steam deck equipment will be retained. The vessels will be used for carrying coal.



Engine-room lay-out of new motor-tanker "Oljaren"

Exhaust and Scavenge Systems in Two-Cycle Oil-Engines

Application of the Time-Area Principle

By DAVID BRUCE

IN two-cycle oil-engines the behaviour of the engine will be found to depend to a large extent on the efficient design of the exhaust and scavenge ports, and the two systems in general. By way of illustration assume that the products of combustion are restrained in their passage from the cylinder, due, say, to faulty design, two conditions which militate against the efficiency of the engine would naturally follow, *i.e.*, a certain proportion of the products of combustion will be trapped in the cylinder at the commencement of the compression stroke, thus causing poor combustion of the fuel to take place, and secondly, the scavenge air-pressure would rise through the greater resistance offered to it, thus requiring a greater power to drive the scavenge air pump than allowed for. The greater scavenge pressure would also have its effect in creating a greater maximum pressure in the cylinder, at the termination of compression, which in turn creates heavier loads on the working bearings.

Imperfect scavenging likewise causes poor combustion of the fuel and hence a greater fuel-consumption per horse-power, owing to the imperfect quality of the air charge in the cylinder. It behooves the designer, therefore,

FIG. 1

TABLE USED FOR CALCULATING TIME-AREA VALUES

Crank Angles	Piston Travel	Port Opening	Circumferential Length of Ports	Area Thro' Ports

to pay some careful attention to the design of these systems especially with regard to the design of the ports, and the scavenge-valve where such is fitted.

With regard to the systems in general, the scavenge-pumps should be of ample capacity suitable for the type of engine, in accordance with the usual present day practice, say 1.25-1.3 for opposed-piston or valve-scavenging engines, and 1.5 or thereabouts for simple port scavenging engines. These figures being the usual relative values of the scavenging-pump volume to the volume of the working cylinders. The number of pumps should be such that there is at least one delivery per cylinder during each revolution of the crank-shaft. The pumps should deliver into a common manifold, of ample capacity to allow a good body of scavenge air to lie in close proximity to the scavenge ports of all the cylinders in order that there may be no wire drawing effect on the ports being uncovered. The exhaust manifold should preferably be of large bore, and as short as possible between the engine and the silencer, in order to prevent oscillations being set up in the pipe which would give rise to objectionable back pressures. Where possible, also, the exhaust

FIG. 2

PISTON POSITIONS

Formula: (1—Cos 0) + (½aSin²0).

Crank Angles	Values of "a"—Ratio of Conn. Rod to Crank. 1/3.75	1/4	1/4.25	1/4.5	1/5
0	0	0	0	0	0
10......	0.0192	0.01896	0.0187	0.01854	0.10821
20......	0.0766	0.0749	0.0741	0.0734	0.072
25......	0.1175	0.1162	0.1147	0.1135	0.1116
30......	0.1673	0.1652	0.1634	0.1617	0.1690
35......	0.2246	0.222	0.2195	0.2174	0.2137
40......	0.2891	0.2856	0.2826	0.2799	0.2753
45......	0.3595	0.3554	0.3517	0.3484	0.3429
50......	0.4368	0.4306	0.4268	0.4225	0.4159
55......	0.5159	0.5103	0.5054	0.4999	0.4935
60......	0.6000	0.5937	0.5882	0.5833	0.575
70......	0.7757	0.770	0.7642	0.7572	0.747
80......	0.9557	0.9494	0.9405	0.9354	0.9244
90......	1.1333	1.125	1.1177	1.111	1.100
100......	1.3029	1.296	1.2877	1.2828	1.2716
110......	1.4597	1.454	1.4459	1.44	1.431
120......	1.6000	1.594	1.5882	1.583	1.575
125......	1.6581	1.657	1.6526	1.647	1.6407
130......	1.7424	1.7169	1.7125	1.708	1.702
135......	1.7738	1.7646	1.7659	1.7626	1.757
140......	1.8211	1.818	1.8146	1.812	1.807
145......	1.863	1.8603	1.8579	1.8557	1.8521
150......	1.8993	1.8974	1.8954	1.894	1.891
155......	1.9301	1.9286	1.9273	1.926	1.924
160......	1.9553	1.9544	1.9531	1.9527	1.9514
170......	1.9888	1.9886	1.9883	1.9882	1.9878
180......	2.000	2.000	2.000	2.000	2.000

manifold should be provided with baffles to direct the exhaust of any cylinder past the cylinder outlets which lie between it and the silencer.

These are comparatively simple matters, however, and do not form the subject matter

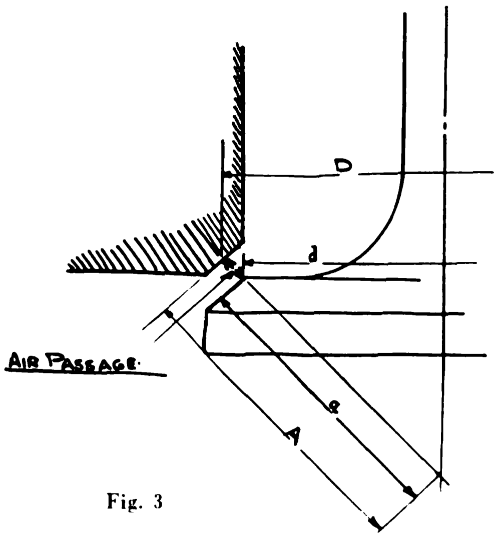


Fig. 3

of this article. The real difficulty lies in the design of the ports or scavenge valve and not in the system in general. Most of the present day methods of fixing up the dimensions of the ports are, to say the least, somewhat crude, and although allowing the engine to run, do not allow of the maximum efficiency being obtained from the engine unless by coincidence. Again, by many of the methods proposed the efficiency of one engine cannot be guaranteed in another engine of different dimensions but of the same type.

The author does not propose to give any method by which the actual design of an efficient set of ports or valves can be fixed, maintaining rather that the most efficient arrangement can best be determined on the test-bed, or in the experimental department, but the aim of this article is rather to show how, once having obtained an efficient design, it can be repeated with certainty in any other similar type engine of different dimensions. The experiment necessary to obtain the first set of ports is not a very costly one, and is one which opens the way to economy of power, and should, therefore, be adopted for that purpose it for no other.

Presuming, therefore, that these basic ports have been settled for one engine of some

FIG. 4

TIME-AREA VALUES FOR VARIOUS OIL ENGINES

OPPOSED-PISTON ENGINES

No.	Cylinder Volume Cubic Ins.	Exhaust Time Area Secs.	Scavenge Time Area Sq. In. Sec.	Cyl. Vol. Exh. T. A. Cu. In. per Sq. In. Sec.	Cyl. Vol. Scav. T. A. Cu. In. per Sq. In. Sec.
1	37,500	38.4	12.1	980	3,100
2	13,450	11.7	5.15	1,150	2,610

PORT-SCAVENGING ENGINES

No.	Cylinder Volume	Exhaust Time Area	Scavenge Time Area	Cyl. Vol. Exh. T. A.	Cyl. Vol. Scav. T. A.
1	17,100	12.01	.....	1,420	....
2	9,028	4.84	2.14	1,870	4,230
3	3,680	.....	0.822	.....	4,460

VALVE-SCAVENGING ENGINES

No.	Cylinder Volume	Exhaust Time Area	Scavenge Time Area	Cyl. Vol. Exh. T. A.	Cyl. Vol. Scav. T. A.
1	3,720	2.9	.815	1,280	4,570
2	13,450	10.5	3.05	1,280	4,410

definite size of cylinder, and for some definite speed of revolution, the difficulty comes in transposing these conditions to another engine, for instance, assume two engines of similar type, having the same cylinder volume; but one operating at 120 r.p.m, and the other operating at 300 r.p.m, it is obvious that an exhaust or scavenge port area that is suitable for the first is not suitable for the other, as the time available to get rid of the same quantity of cylinder products is much less in the case of the higher speed than in the case of the slower speed, hence it follows that in comparing exhaust and scavenging systems the duration of the operation must be taken into account.

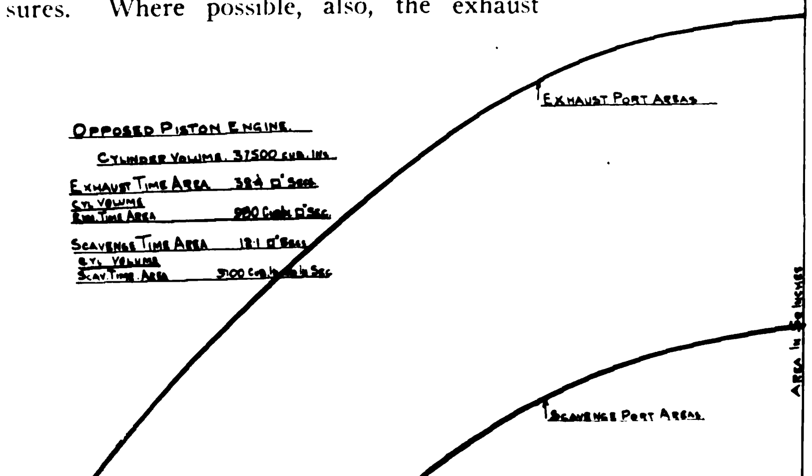


Fig. 5

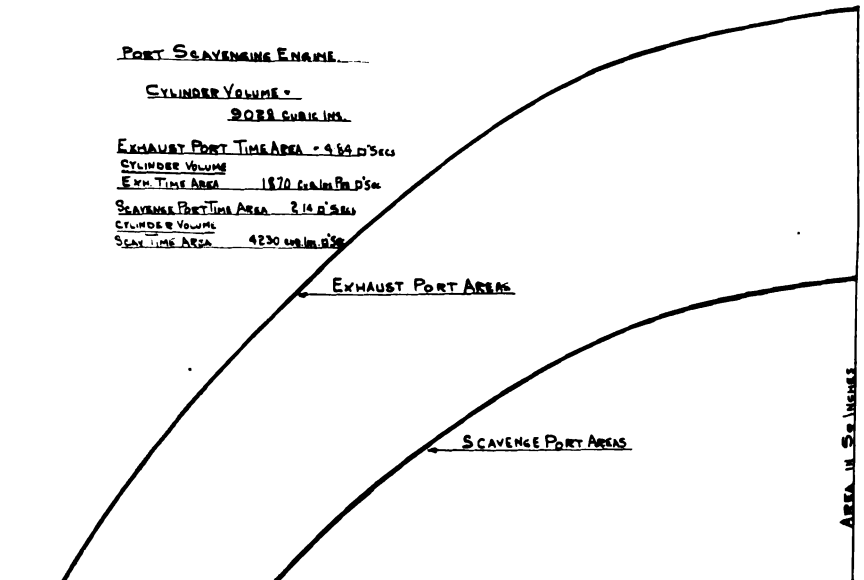


Fig. 6

Again, consider two engines having the same stroke and revolution speed, and hence the same piston-speed, but having different cylinder bores, in other words different cylinder volumes, it naturally follows that for the same port efficiency, the port area must be based on the cylinder volume only. Hence from the foregoing it naturally follows also that for engines having different cylinder volumes and different piston speeds any method of comparing the exhaust or scavenge systems must of necessity include the port area, the duration of the opening, and the cylinder volume.

With regard to the area it is apparent that the area through the ports or valve is constantly changing and so it becomes necessary to adopt the average area which obtains throughout the period under consideration. This combination of time and area is called the time-area value, the units usually being given in terms of sq. inches and seconds, thus a time area unit is called a sq. inch second, and is the average area available for a definite period, the two values being multiplied together in order to obtain the new value.

gether give the port area which is entered in column five. The scavenge-port area is obtained in a similar manner, and then both are plotted onto a chart, having port area on the vertical scale and crank angles on the horizontal scale. As the opening and closing periods of the ports are identical only the one side of each curve need be plotted. The area under these two curves must now be obtained, and then, dividing by the length of the curve the mean height, and multiplying by the scale of the vertical ordinates, the average area through the ports is to hand.

It is now necessary to calculate the time through which the port is uncovered. This is simple and is given by

$$\frac{1}{6} \times \frac{A}{R}$$

Where A is angle of opening. R is the revs. per minute.

Having the average area and the time through which this is available it is only necessary to multiply the two in order to obtain the time area and this is now done.

Where valve-scavenging is the order of the day the procedure for obtaining the scavenge time area is a rather more tedious process but

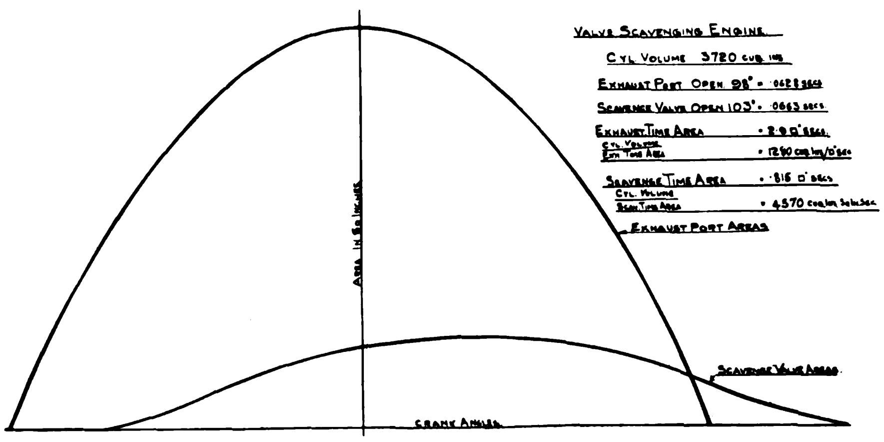


Fig. 7

not a whit more difficult. The area through the valve must be at right angles to the valve seat, and is therefore the area of the narrow annular ring shown in Fig. 3, this ring is also the sloping surface of the frustrum of a cone of base D and sloping side A.

Hence the area through the valve is equal to the difference between this cone and the one of base "d" and sloping side "a." The area of the sloping surface of a cone is of course given by the circumference of the base multiplied by one-half of the sloping height. This area must be obtained for various crank-angles, the procedure being as follows. The shape of the scavenge-valve cam profile is set down to a convenient scale and the lift of the valve for various angles duly noted and recorded. For each of these lifts the area through the valve is worked out and plotted as before, the remaining work being as before.

To apply this method in practice it is necessary to obtain the time area for the ports as fixed up by the experimental department thus obtaining basis figures for future engines. This basis figure being the time area value divided by the cylinder volume for the engine. Having a new engine to design, the cylinder volume of the new cylinder should be divided by the basis figure thus obtaining the time area required through the new ports or valve. The remaining work must be a case of trial and error, to obtain the requisite value.

It is not to be expected that the time-area cylinder-volume figures for engines of various makes as now constructed would agree very closely, and as full particulars are rarely available of any engine the following diagrams called for some reasonable assumption to be made, therefore, although care has been taken to obtain as correct a result as possible, the following diagrams are given with reserve, and

The actual method of obtaining this value is as follows:—

It is necessary to have the following data before commencing the work,

- Bore of Cylinder.
- Stroke of piston.
- Revs. per min.
- Exhaust-Port Length.
- Scavenge-Port Length.
- Connecting-rod Crank Ratio.
- Circumferential length of ports

Having these values proceed as follows by making a table having columns as shown in Fig. 1. Taking the length of the exhaust ports find what fraction of the crank throw this is, and looking up the table of piston positions given in Fig. 2 under the corresponding connecting rod crank ratio look for the figure which tallies with the value obtained above, which will in its turn give the crank angle. In the table Fig. 1 put down the crank angles for say every 10 degrees up to the value required. For each of these crank-angles calculate from the piston position table the travel of the piston from the end of its stroke, and note these values in column two.

It should be noted here that for single acting engines that the values taken are from the outer end of the stroke and consequently all values of the crank angles must be reckoned from the outer end, hence for a travel of 20 degrees from the end of the stroke it is necessary to look up the piston position for a crank-angle of 180 minus 20, *i.e.*, 160 degrees.

Having obtained the position of the piston it is an easy matter to subtract and obtain the amount of port that is uncovered at that respective crank-angle, this value should accordingly be entered in column three, the value in column four is of course a constant and columns three and four when multiplied to-

are chiefly intended as a guide to the general appearance of the curves. Where the valve-scavenging engines are concerned fairly full particulars were available and it will be noticed how in this case the results are very similar. In view of the foregoing the values given should also be taken with reserve for as was pointed out previously the basis value should be obtained experimentally. See Table Fig. 4 and Fig. 5, 6 and 7.

This system does not of course apply to four-cycle engines, as in this type of engine the exhaust and scavenge periods take the whole duration of the stroke, while the piston also acts as a pump-plunger to drive out the products of combustion and to draw the fresh-air charge in to the cylinder.

Another case in which the time area method can be applied is to the fuel-injection system, the same method being adopted throughout, the basis value being obtained usually from the test-bed results.

TWO NEW BIG MOTORSHIPS FOR STANDARD OIL OF N. J.

The Standard Oil Co. of N. J. has reinstated a pre-war contract with the Howaldtswerke of Kiel for a Sulzer two-cycle Diesel-driven tanker of 15,870 d.w. tons. Twin 1,500 shaft h.p. engines are to be installed. The Company is also negotiating with Krupps of Kiel, for another motorship contract.

ROGERS WILL DO HIS BIT

David Rogers, during the war days one of the leaders in building the great fleet of Shipping Board vessels, in charge of the Skinner & Eddy Yard at Seattle, Wash., recently stated in an interview at his home, where he has been recovering from serious illness, that motorships are being built by English, Scandinavian and other foreign countries and that "America will have to build motorships to meet competition. The day is coming soon when we will have to do that. I'm on my back now but I am going to be here to help build America's motorships."

VICKERS PAY DIVIDEND

The directors of Vickers, Ltd., have declared a dividend for the year 1921 at the rate of five per cent per annum, less tax at six shillings to the pound, on the ordinary shares, which indicates efficient management on their part, as the year 1921 was a severe test for shipyards. No dividend for the previous year had been paid on the ordinary shares, the available funds being carried forward.

MOTORSHIP'S ECONOMY CAUSES LOWER PASSENGER-RATES

Because of the great economies effected by the British India Steam Navigation Company's new motor-passenger liner "Domala" on her maiden voyage from Plymouth to India, the owners were enabled to lower the charge of first-class passenger rates on the second voyage of this ship—this charge being less than those of their regular steamers on the same route. On the maiden voyage passengers noted the absence of vibration in the vessel and the freedom from soot and smoke, also the inconvenience of coaling en route was avoided.

Actual Running Costs of Motorships

Valuable Information Released by a Big Swedish Shipowning Company Who Have Ordered Motorships with Three Designs of Diesel Engines

By TADGE MADSEN
Superintendent-Engineer, Transatlantic Steamship Co. Göteborg

Part III

(*Continued from page* 521 *July issue*)

Returning to the "Yngaren's" voyage, we certainly had experiences now and then, but I am glad to say that there was nothing indicating any mechanical difficulties whatsoever. Ninety-nine per cent. of the stops we had, and also the work otherwise, was due to material defects or a little lack in workmanship here and there. It is really fine to know this, and that these small things soon will be right—and for my part I consider the trip and everything just splendid. On the outward voyage to Java and Australia we averaged 2,550 horsepower.

We kept the above load for certain reasons. and particularly for the sake of Doxford's. The motor being the first result of a long, long work, it had to be well treated and given an easy start. But I shall be dead before I understand what "the block coefficient has to do with a motor's i.h.p." If the hull is not so favorable for the i.h.p. you have bought, well, that is a pity; but luckily enough the ship is very often not down on the Plimsoll mark. Your i.h.p. must be there when you wish it, even overload if necessary. The ship's body will do its best to follow suit. To run a motor with full power means no real extra work to anybody; whatever power, the men in charge must be awake. It is all a matter of turning one wheel a little bit one way, and another wheel a bit the other way—if the motor is right. That is the very great difference between a steam engine and a motor. In the steam engine the buyer pays for power that he never will get—or if he could get it out of the engine it would only be by changing boilers, number of firemen and size of bunkers. Further, the economical speed of a steamer is always much more pronounced than that of the motorship.

Therefore, it is of tremendous importance never to sell a Diesel engine without expecting it to be driven at full power, particularly to firms with some knowledge of motorships. Some have done it and hurt the growing courage of the modern and intelligent shipowner. Our director, Gunnar Carlsson, told us when he left the "Yngaren," in Brixham, "Do not forget to take out the power going home with our wool." * * * Our agent asked before leaving: "To talk seriously, when will you be in Dunkirk, do you think?" Having often talked the question over with his chief engineer and others, the captain said: "In forty-two days." He was not half an hour wrong.

Thus the full power was taken out, and I am certain the motor has not suffered—it has just been tested, and well tested, and as far as we can see at present it can start out again right away; but certainly there are a few improvements to be made and some defective parts to be renewed that we were prepared for.

The main engine has thus so far proved just splendid. In Australia everything was opened up and found in perfect condition. It was the first motor of its kind and one must give this some consideration.

I would like to know the number of days the engine made less than 3,000 i.h.p., and the last diagrams taken were 3,305 i.h.p., which means 10 per cent overload. I asked Mr. Keller once if he would mind if Transatlantic took out 10 per cent extra for their money. He said, "I do not exactly like it, but do so for a few days if necessary; it cannot hurt." Thus it was done when it was necessary, in bad weather, too, and the ship kept a speed of 11¾ knots. We have made 12½ and we have many 12 knots watches.

Thus even the hull is very satisfactory though we did not like strong headwinds.

Our real trouble was with the auxiliary engines, but Doxford's had a very short time to fix them up in. The main trouble was with certain bearings which the oil did not reach. The chief-engineer eventually got them in working trim. In the Suez Canal, when we were on the bank, and tried to heave her off, the different engines' amperes were easily added up to 1,000 amperes, for many a good period. Mechanically they are splendid, too, though the combustion will have to be improved.

Except for the pumpside of the bath water-pump I do not know of troubles with the electrical outfit in the engine-room. The fuel-oil transfer pump, however, had the idea not to draw from certain tanks. I do not know of more than one hour's hitch (No. 3 hatch) in the handling of 20,000 tons of cargo. That is also a figure.

Conclusion.—Another of Transatlantic's motorships is back in home-waters, and I have tried to put before you a little of the shipowner's side. It may happen that various problems like four-stroke or two-stroke cycle, etc., could be fought out by them, without too much "chewing" on it from the builders' side, etc. Naturally, exchange of views is beneficial, but they must be made in the right spirit. The shipowner himself is, however, bound to find out, by and by, what is most suitable for what is to-day called "actual running costs of motorship." The YNGAREN is home. Many years of solid work at Doxford's have ended up in success—and I congratulate these men having done it—Robert and Charles Doxford and K. O. Keller. Allow me also to give my Director at home, Gunnar Carlsson, the far-seeing and not too downhearted shipowner, my congratulations. He and the Company also were very worthy of the present success.

I would also mention the master of the ship, Captain Huldtgren, and the chief-engineer. Mr. Lidslot. There was discipline on board everywhere; and the best spirit to work and work done, too.

Remarks.—On Norfolk-Panama part of the first voyage (8), there were only two boilers in service for a period of 130 hours, the third one being arranged for fuel-oil for the run Panama-Wellington. Thus, afterwards there were one boiler on oil and two on coal consuming respectively 9.5 tons of oil and 30 tons of coal per 24 hours. In reality the boiler was in oil-fired service for 25 days, and it may be of interest to some to know that "Yngaren," for example, averages a bigger shaft horsepower than "Auten," when the 9.5 tons of fuel oil are burnt inside "Yngaren's" motor. Thus, what was consumed in the two coal-fired boilers in the case of the "Auten" is absolutely an indisputable saving in the case of "Yngaren." It may also be considered that the "Auten" carried about 1,400 tons of coal in addition to 322 tons of fuel oil, which oil, burned inside a motor would easily have taken her to the port in question with the same speed. On voyage (9) she started with some 1,500 tons of coal, arrived at Durban with some 360 tons and left Durban again with 1,565 tons, having 159 tons left when the cargo was discharged at the final port. The carrying round-the-world of these weights and their influences on the cargo-carrying, do not need much explanation to the modern shipowner.

ENGINE-ROOM CREWS

M. S. "Bullaren" type:—1 chief-engineer, 4 engineers. 1 electrician, 1 turner, 1 blacksmith, 8 motormen—16 men.

M. S. "Yngaren":—1 chief-engineer, 3 engineers, 1 electrician, 1 turner, 1 blacksmith, 6 motormen—13 men.

Steamer "Auten":—1 chief-engineer, 3 engineers, 3 greasers, 1 donkeyman, 3 trimmers, 6 firemen, 1 day man—18 men.

The various figures above can be discussed and looked upon from different sides. It is really unnecessary for me to try to make comparisons: I prefer to be a good neutral, but I hope those interested will see something useful in the above figures.

Seven Months on the "Yngarin"

M.S. "Yngaren."—It is 1 a.m. I am sitting in my pleasant cabin just back from down below having, as often, seen the midnight watch take on their duties. It was my last midnight visit because at noon to-day, the 9th of April, we shall be waiting for the tide to get inside the docks of Dunkirk. And then the whole voyage will just be a memory—a memory of both happy and anxious feelings. But the latter will disappear; it will soon just be a memory of when we got mixed up with the Doxford opposed-piston type motor and I, as a consequence, had to motor round the world for seven and one-half months to gain actual sea experience and eventually to see with my own eyes, whether the prophets were right.

Down below everything was just as nice as usual if not nicer, because to-morrow (or really to-day) we shall be in port and it is Sunday, too, and no one will be able to see that the motor has worked hard—very hard—for the last forty-two days. As usual I asked the engineer going off: "What were the revs.?" "Seventy-five, sir; but the clock has gone wrong, it is more." And so it had.

Let us now come to the "Yngaren's" actual runs. I do not wish in any way to favour this engine, but as I am just back from a voyage with her of some 28,000 miles, having stayed with her all the time to learn and see certain things, I do not consider it fair not to give a rather full description of what we experienced in addition to what is mentioned in the consumption figures. I do this especially because *the birthplace of both motor and ship is almost "round the corner."*

Before going further, I wish to point out that the maiden voyage was carried out with Transatlantic's own staff, and *their* chief-engineer responsible for the good treatment of the motor. It was originally intended by Doxford's that seven English engineers should join the trip. Before starting out three were needed at Doxford's, and at Port Said, where Mr. Keller left, three others followed him. leaving the second English engineer as their guarantee man—but with orders from Mr. Keller, by our request, never to interfere with the running of the engine. Thus, this engineer was just there to write his reports home and give the engine-room staff a helping hand when necessary. This engineer's position was not really to be envied, though we all knew that he was a splendid engineer.

I have mentioned this matter somewhat elaborately, but to my mind it is of great importance. If you have—*as you must have*—good engineers, and especially a good chief-engineer, you must not hurt their feelings by taking away their responsibility.

[*Finis*]

Diesel Development in the British Navy

By Engineer-Vice-Admiral Sir Geo. G. Goodwin, K.C.B., L.L.D., ex-Engineer-in-Chief of the British Navy

Part III

(*Continued from page 522 July issue*)

It is to be noted that the use of aluminum pistons enabled connecting rods of lighter section to be used, and, combined with the use of a rod of I-section instead of a circular section, enabled a very considerable reduction of reciprocating weights to be effected. From these reciprocating weights, assuming the same speed of 380 revolutions per minute in the two cases, the bearing pressures were worked out for the experimental and the standard engines respectively. These were found to be considerably less for the experimental engine, and the speed being the same in both cases, the reduction is a measure of the increase of the mechanical efficiency, which is estimated at about two per cent.

The use of aluminum alloy for pistons carries with it also a further incidental advantage due to the high thermal-conductivity. Pistons of such alloys, up to 20 inches diameter, have now been run for a considerable period.

The next step decided upon was to proceed with the design of a single-cylinder unit of about 300 b.h.p., embodying as far as applicable the results of experience gained with the earlier experimental engine. The dimensions decided upon were 20 inches diameter and 20 inches stroke, with full speed revolutions of 390 per minute, *i. e.*, a piston speed of 1,300 feet per minute, which was a considerable advance on previous practice.

It was decided to fit a piston of aluminum alloy as in the experimental engine, but in this case arrangements were made to cool the piston internally by the circulation of oil.

The engine has now been in use for experimental purposes for quite a considerable time, and has run quite satisfactorily. In particular it may be mentioned that no trouble at all has been experienced with the aluminum piston, although it has from time to time been subjected to high temperatures and high mean-pressures up to as much as 150 lbs. per square inch. Also even at these very high mean-pressures it has been recently found possible to obtain an invisible exhaust.

The reduction of inertia stresses is not the only question that has to be solved in high-speed engines. There are the questions of adequate valve or port area and valve operation, for the induction and scavenging of the gases becomes of great importance, together with the associated questions of cylinder cooling, a greater number of heat units in a given time having to be conducted away as the engine speed increases, if trouble with exhaust valves, etc., is to be avoided.

As regards (2), the problem of obtaining the maximum mean-pressure with efficient and smokeless combustion raises the whole question of methods of fuel injection. The fuel on admission must ignite rapidly and burn rapidly without excessive and sudden rise of pressure (referred to as detonation), since late burning has a prejudicial effect on the fuel economy of the engine. To obtain these conditions is no easy matter in high-speed engines.

To meet the general requirements the jet of oil entering the cylinder must be pulverized to such an extent as to present sufficient surface to the compressed air in the cylinder to enable it to burn quickly, but at the same time the jet must have sufficient penetrative power to enable the fuel to reach the position where air is available for its combustion. These two requirements are opposed, as the greater the pulverization the less the penetrative power.

A consideration of (3) indicates that our desires will not be obtained unless we develop the double-acting two-stroke engine, which, however, subject to our limitations of space, especially in the direction of head-room, opens up difficult questions. I have no intention of raising the question of two-stroke *versus* four-stroke engines, as this has been a well-discussed subject.

Concurrently with the design and construction of the 300 brake horse-power experimental engine for the laboratory, an experimental engine of approximately the same size and power was designed and built for the Admiralty by Vickers, and this engine has run successful trials during the last twelve months. A further experimental engine of approximately the same power, but of the "V" type was constructed for the Admiralty by Messrs. Beardmore, but the trials of this engine, although they are not yet completed, have given very promising results.

Two-Stroke Cycle Engines. The foregoing experimental work refers entirely to engines of the four-stroke cycle type, but the possibilities of the two-stroke type have not been overlooked, and an engine of this kind has been constructed by J. S. White & Co., and is now installed at the laboratory. This single-cylindered engine is designed to produce 400 brake horse-power at 390 revolutions per minute, and it is expected that experimental work upon it will provide very valuable data.

Double-Acting Two-Stroke Engines. A good deal of attention has been directed recently to the possibility of such engines, and a large engine of this type from which it is hoped that most valuable experience and information will be gained, is already being designed and under construction for the laboratory.

(Conclusion)

IS THE DOXFORD ENGINE A SUCCESS?—THE ANSWER

The Transatlantic Steamship Co.'s new Doxford-engined motorship, YNGAREN, arrived at San Pedro, Cal., July 1st, on the first of its regular voyages which will be made between European ports and the Pacific Coast. She discharged at San Pedro and San Francisco her cargo from Newcastle-on-Tyne, England, consisting of 1,668 tons of coke, 810,000 fire bricks, 25 tons of fire clay and 250 tons of pig iron. She then proceeded to Portland, Oregon, to load wheat and other grain for Belfast, Ireland.

The consumption of fuel and lubricating-oil for the voyage from the Tyne to the dock at San Pedro was 315 and 1.72 tons respectively, the consumption per knot per i.h.p. being 147 grams (0.32 lb.). Only a few stops for minor adjustments were made on this trip of 7,970 miles by log and 8,538 miles by engine records, which was made at the rate of 10.57 knots.

LAUNCH OF MOTORSHIP "EKNAREN"

Doxfords launched the new 10,000 tons, single-screw, 3,000 i.h.p. motorship EKNAREN on July 25th. Owners, Transatlantic Steamship Co., Göteborg.

CENTRAL WORKS WILL BUILD DIESELS

Construction of Diesel engines is about to be taken up by the Central Marine Engineering Works, Hartlepool, England.

Diesel Yacht "Cynthia" Runs Trials

New Todd-Winton Built Craft for Commodore Mills

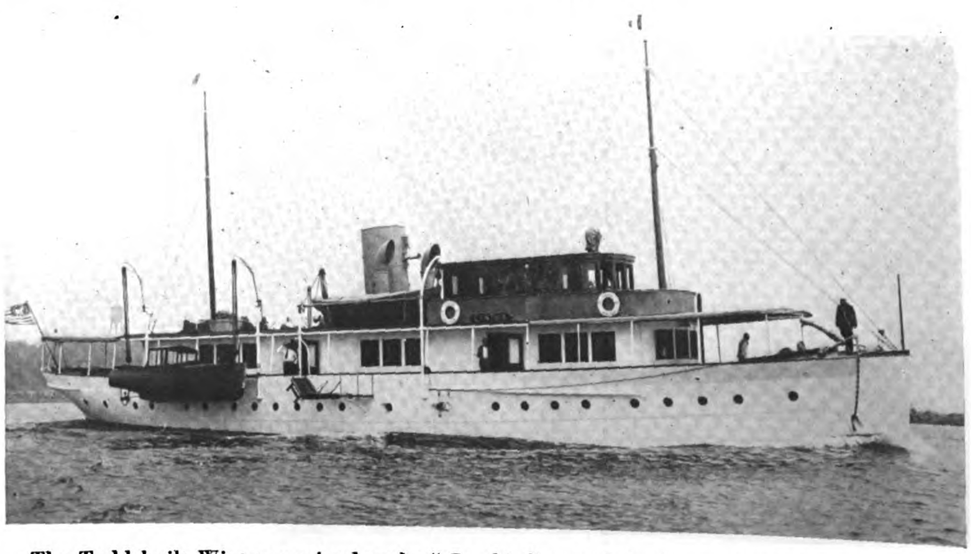
On Thursday, July 20, the new steel Winton Diesel-engine motor-yacht CYNTHIA ran successful trials in New York harbor, many men prominent in engineering and technical publications being present. Built from designs by and under the supervision of Cox & Stevens of New York by the Tebo Basin plant of the Todd Shipyards Corporation, the CYNTHIA becomes the floating home of Commodore Merrill B. Mills of Detroit, Mich., who will use her in both Northern and Southern waters throughout the year.

She is of the following dimensions:

Length over all	129' 0"
Breadth	26' 0"
Draft	6' 6"
Horsepower	450
Speed	12 knots
Cruising radius	4,000 miles

Her two six-cylinder four-cycle Winton Diesel-engines ran very smoothly on the trials and the reliability, prompt reversing and maneuvring qualities were noted by all. Because of the use of Diesel-engines the designers were able to provide accommodations which could not be obtained in a steam craft short of 150 foot.

In the engine-room, in addition to the main-engines, are 7½ k.w. and 5 k.w. Winton electric-generators, an auxiliary air-compressor, an electric-driven Exeter fire and bilge-pump, an Exeter electric-driven oil-transfer pump, a salt and fresh water pump and a complete electric lighting system. Her anchor-windlass is a Mead-Morrison electric-windlass and a boat-handling winch of the same make is on the upper deck.



The Todd built Winton engined yacht "Cynthia," owned by Commodore Merrill B. Mills

New single-screw fruit-carrying motorship "Segovia," propelled by a North-Eastern-Werkspoor 1400 i.h.p. Diesel engine

Interesting Notes and News from Everywhere

The new Lamport and Holt motorship LASSELL sailed from Liverpool, England, on July 8th, on her maiden voyage.

The hull of the MARIE owned by A. F. Johnson of Sacramento, Cal., is now at the Lantheri Shipyard at Pittsburg, Cal., where two 75 h.p. Diesel-engines are to be installed.

The Deutsche Werft, Hamburg, had at the beginning of this year contracts on hand for 65,400 deadweight tons of motorships, all due for delivery next Spring.

A 5,750 tons geared-turbine driven freighter will be equipped by the New York Shipbuilding Co. with the 2,000 i.h.p. Werkspoor Diesel-engine now completing in their shops at Camden, N. J.

The CAP FINISTERRE, of 1471 tons gross, will inaugurate a freight service between Genoa, Italy, New York and San Francisco. She is No. 315 in the MOTORSHIP YEARBOOK list of Motorships of the World.

Little has been heard of late regarding motorships under construction in Italy. At the present time a new combination cargo and passenger ship of 8,100 tons d.w.c. and 3,000 i.h.p. is under construction at the Spezia Shipyard of Ansaldo-San Giorgio, Ltd.

Rapid progress is being made with details of the plans for the conversion of two steamers to Diesel-electric power by C. D. Mallory & Co., New York. One hull has been bought.

The Rouse Towing Co. of Seattle has bought a 75 h.p. Western oil-engine for a tug.

An auxiliary schooner yacht to be powered with a 100 h.p. Fairbanks-Morse oil-engine is being built at the James Shipyard, Essex, Mass., from designs by William Hand, Jr., length 139′, breadth 26′, draft 30′ 7″.

On August 6th, laden with a cargo of coal from Hastings, N. S., the Danish single screw motorship, LEISE MAERSK, arrived at New York, consigned to Isbrandtren, Moller & Co.

It is reported that one of the South American republics is in the market for a small fleet of Diesel-driven submarine-type mine-layers of 2,000 shaft h.p. each.

Vice-Admiral Sir George Goodwin, K. C. B., former Engineer-in-Chief of the Navy, will become one of the Board of Richardson, Westgarth & Co., Ltd., Hartlepool, England, which firm is building Carels and Tosi Diesel-engines.

BELTRAMI is the name of the new steel twin-screw Mianus-Diesel vessel now building by John Eichleay, Jr., Co., of Pittsburgh, Pa., for the Mississippi River Commission. She will be completed in December of this year.

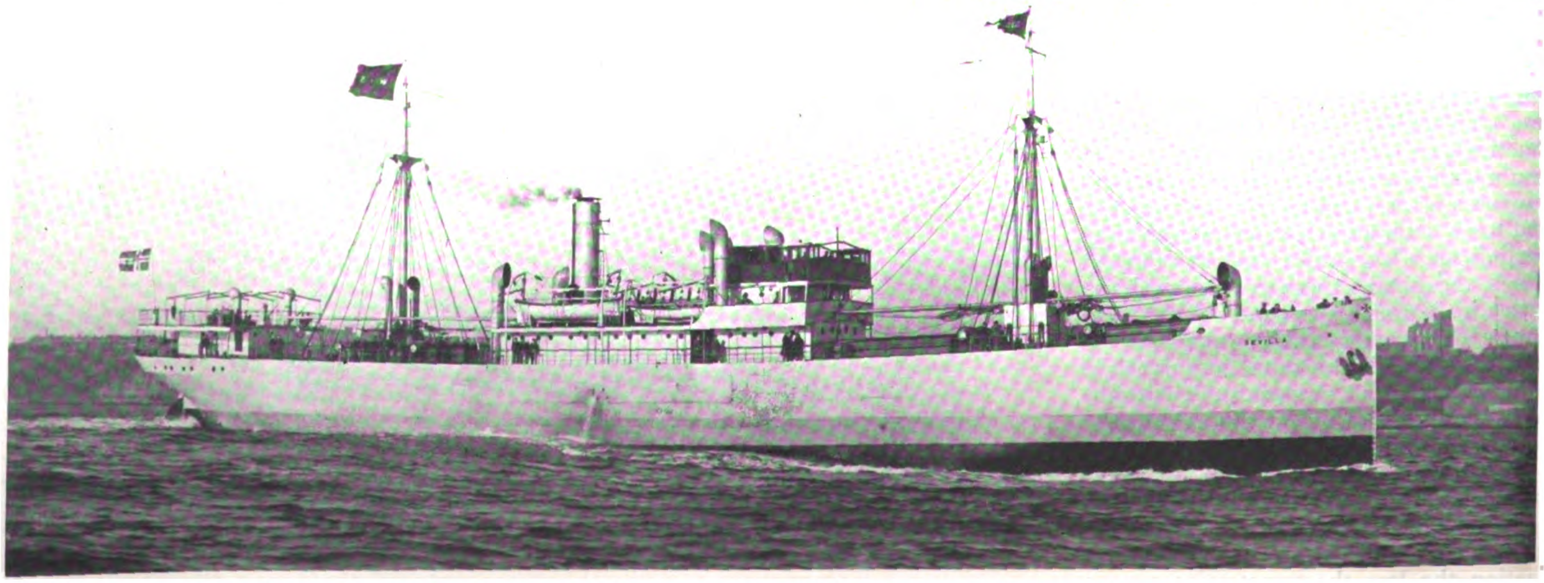
The motortanker, CHARLES BRALEY, caught fire from a gas explosion in the pump-room and was abandoned in the Gulf of Mexico July 25th, while bound from Tampico, Mex., to Baltimore, Md.; the crew was saved. This vessel is No. 187 in our YEARBOOK.

On August 2nd the steam tow-boat EDWARD was completely destroyed and her entire crew of five killed by a boiler explosion in New York Harbor. Such accidents with steam plants are somewhat frequent, whereas such a disaster with a Diesel oil-engined tug-boat has never occurred.

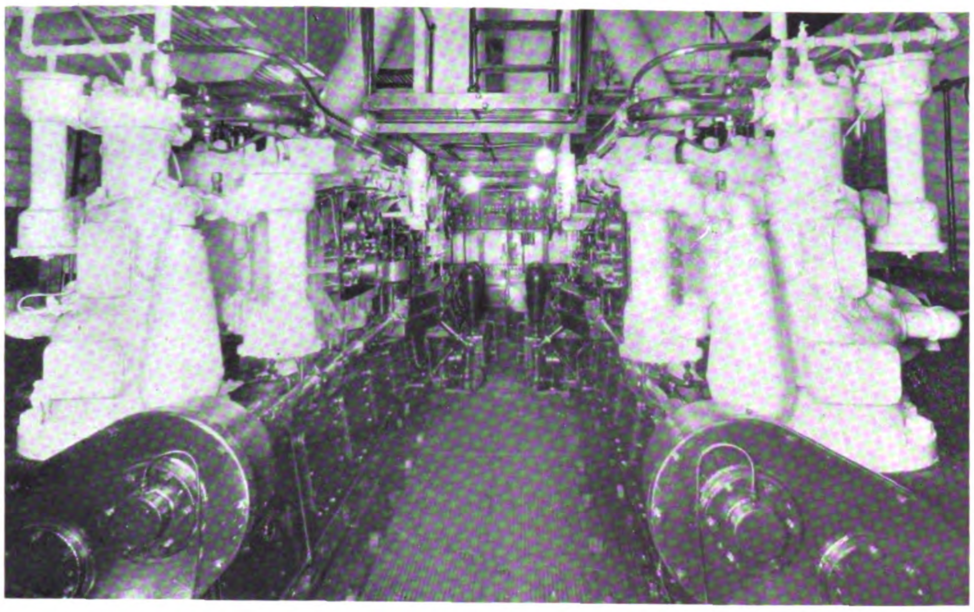
A 250 b.h.p. Still type combination oil and steam engine is being built by Peter Brotherhood, Ltd., of Peterborough, England. It is of the airless-injection four-cycle type. Other Still engines work on the two-cycle system.

The Palmers Shipbuilding & Iron Works, Newcastle-on-Tyne, England, are building a 3,000 i.h.p. single-screw motorship for the Ocean Steamship Co. of Liverpool. The Diesel engine is of the Burmeister & Wain type.

HJELMAREN, a single-screw motorship of 4,400 tons was launched at the Götaverken shipyard on July 22nd. A two-cycle Polar Diesel engine turning at 90 r.p.m. is fitted. The keel was recently laid for the new motorship COLESNAREN for the Transatlantic SS. Co. She is of 4,000 tons d.w. and will have a Götaverken B. & W. 1,600 i.h.p. Diesel engine.



"Sevilla," sister Diesel ship to the "Segovia," both are owned by Otto Thoresen



Twin Winton Diesel engines in Mr. Mortimer L. Schiff's new motor-yacht "Dolphin"

Trials of a Vickers Diesel-engined motor-tanker of 14,200 tons loaded displacement were run during the middle of July. This is the fourth sister ship built for Tankers, Ltd. Vickers twin 1,250 shaft h.p. Diesel engines are installed.

The Societa di Navigazione Motovelieri of Naples have taken delivery of the 900 tons d. w. auxiliary sailing-vessel MARIA. An 120 h. p. Climax oil engine was installed by the builders, the Cantiere Navale Ottavio Piccinich, Lussinpiccolo, Italy.

The steel auxiliary schooner MOONLITE, now owned by the Admiral Line, has left Baltimore for the West Coast, where she will be fitted with McIntosh & Seymour Diesel engines. The Chief Engineer is Otto V. Kories, whose interesting gas turbine was recently illustrated in MOTORSHIP.

Trials of the 2,050 tons d.w. combination cargo and passenger motorship DUMRA have just been run. She has been built for the British India Steam Navigation Co. by John Hill & Sons of Bristol, England. In addition to cargo she carries forty passengers and will be used in coastwise trade. Twin 500 shaft h.p. North British Diesel engines give the vessel a speed of eleven knots.

CARL VINNEN, a 2,400 tons deadweight auxiliary sailing-vessel built by Krupps ran trials on July 5th. She is owned by J. A. Vinnen & Co. of Bremen, Germany, and a 350 b. h.p. Krupp Diesel-engine is installed. Length 253', breadth 44' 3", depth 21' 9". She left for Melbourne with a cargo of deal lumber.

The HAURAKI of the Union Steamship of N.Z. Co.'s fleet recently completed her first voyage from Clyde to New Zealand, including a run from San Francisco to Vancouver and return. The average speed was 11½ knots and the fuel consumption 14½ tons each 24 hours on the voyage, which speaks well for her North British Diesel-engines.

Winge & Co. of Kristiania, Norway, have ordered from the Nederlandsche Scheepsbouw My, Amsterdam, Holland, a 6,900 tons deadweight steel cargo motorship of the following dimensions: Length between perpendiculars 374'-9", breadth 51'-2½", and depth 25'-3". She will be equipped with two Werkspoor Diesel-engines of 1,200 h.p.

The motorship, PINTHIS, of 1111 gross tons, was sold at public auction by the U. S. Marshal on July 7th, at Brooklyn, N. Y., to the Fall River Steamship Co., of 11 Broadway, New York. This company was recently incorporated under the laws of the state of Delaware for $86,000. The PINTHIS will be operated for this company in the coastwise trade by C. D. Mallory Co.

Rapid progress is being made on a very large submarine at the Chatham dockyard, England, for the British Navy. In the first seven months seven-hundred tons of steel was put into the hull, and more has since been added. In this super-submarine two 4,000-5,000 h.p. Wallsend-Sulzer two-cycle type Diesel-engines are to be installed.

In the submarine chaser PRINCE OF WALES, owned by Neil & Cole of San Francisco, a 100 b.h.p. Fairbanks-Morse oil-engine is being installed.

For a tow-boat nearing completion and owned by R. J. Ultican of Aberdeen, Wash., a 200 b.h.p. Fairbanks-Morse oil-engine has been purchased.

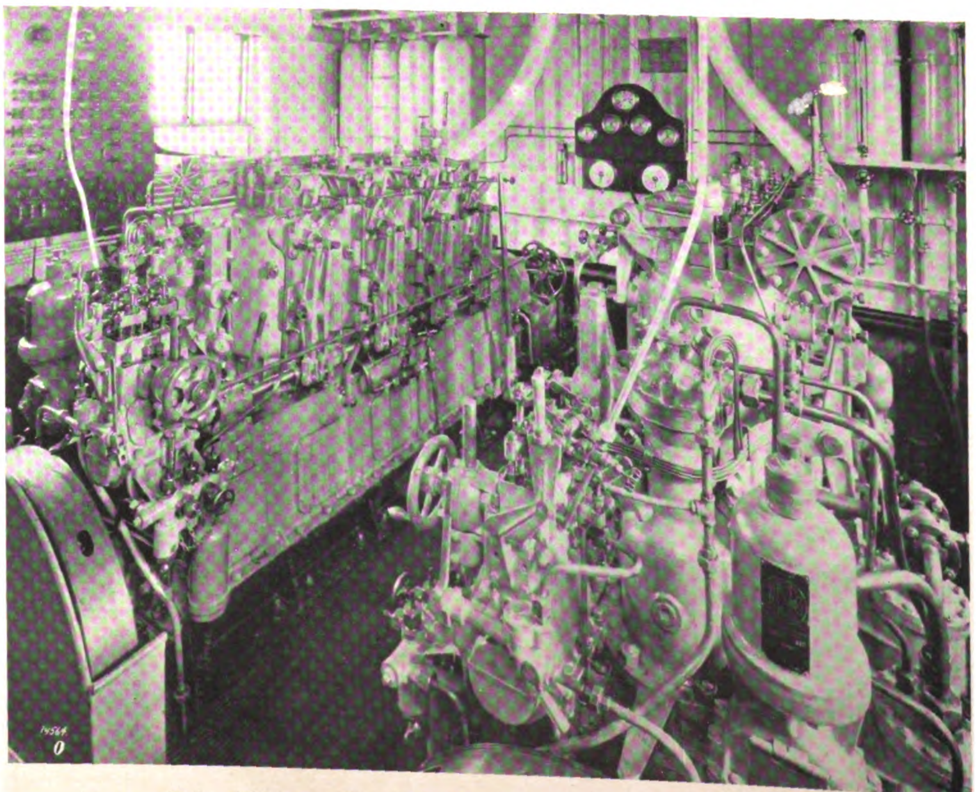
In the old 90' hull ARAGO, owned by the Washington Tug & Barge Co., a 125 b.h.p. Enterprise oil-engine will be installed.

A set of 1,350 shaft h.p. Burmeister & Wain type four-cycle, six-cylinder Diesel marine-engines have been ordered from John G. Kincaid & Company, Greenock, Scotland, for a new motorship to be built on the Clyde for unnamed British owners. This firm has also secured an order from Spanish owners for a single-screw engine of the same design, but of 1,900 shaft h. p. The hull is building in Spain. Kincaids are sub-licensees of Harland & Wolff, and this will be the largest long-stroke B. & W. engine yet ordered.

The BLUE SEA, a 67 ft. fur-trading boat owned by Olaf Swenson & Co. of Seattle, Wash., recently started from that port on a 4,000 mile cruise to the Kolyma River in Arctic Siberia, nearly 1,000 miles West of Behring Straits. She has a 45 h.p. Fairbanks Morse oil-engine and aboard for the voyage is R. S. Pollister, manager of Siberian territory for the above company. The work ahead of her can well be realized when it is known that for two years not a vessel has succeeded in reaching the Kolyma River because of heavy ice.

TENTATIVE PLANS FOR OCEANIC STEAMSHIP CO.'S PASSENGER-CARGO MOTOR LINERS

America will have the world's largest Diesel-driven passenger liners if the Subsidy bill shortly becomes law. Already we have referred to two such vessels to be built for the Oceanic Steamship Co. of San Francisco. The following are the preliminary specifications for these big motorships:—Three screws if direct Diesel driven, two if Diesel electric or turbo-electric. Maximum speed 18 knots; gross tonnage 9414; average speed 17 knots; draft, designed, 25 feet; depth to shelter deck, 40 feet; breadth, moulded, 60 feet; length, B. P. 475 feet; length O. A. 494 feet. Accommodations: 203 first-class passengers and 46 second-class; crew, 143; total, 492. Decks: bridge, boat, promenade, main, lower and orlop; officers' quarters on bridge deck; crew space forward under shelter and main decks; first-class passenger accommodation amidships on main, shelter and promenade decks; second class aft on same decks; storage facilities for mail forward under shelter deck, with special storage room for films; bulk storage capacity of grain, 237,000 cubic feet; fuel tank capacity, 1980 tons.



Pair of Nelseco Diesel engines in the house-boat "Miramar"